

KNOWLEDGE & CHARACTER

BY

MAXWELL GARNETT

C.B.E., Sc.D.

What should be the aim of education? If we can tell how a child's work and play may make him into the man he ought to be, we have next to ask: What is the perfect man? Is he but a cell in the body of Leviathan? Or may he have within him some godlike or eternal quality, of value far transcending states that wax and wane and cease? If so what kind of people would make a perfect world, a world that would allow every human soul to get, as well as to give, the best and the utmost that life on earth can yield? In the light of our answers we can see the purpose of education: It is to integrate the character of every man and woman: to develop in each a single wide interest that shall fit him for some particular walk, and for realizing his own best self in this way of serving God.

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PREFACE

In this book I have tried to say, more simply and more shortly than in *Education and World Citizenship*,¹ what I think should be the aim of education. Experimental psychology has laid a firmer foundation for this work than was available twenty years ago; and, as its last chapter shows, many of its conclusions can now be checked against the enlightened findings of the *Spens Report*,² a document undreamt of when the earlier volume appeared.

How experience makes character is my book's main theme. If we can tell how a child's work and play may make him into the man he ought to be, we have next to ask: What is the perfect man? Is he but a cell in the body of Leviathan? Or may he have within him some godlike or eternal quality, of value far transcending States that wax and wane and cease to be? If so, what kind of people would make a perfect world, a world that would allow every human soul to get, as well as to give, the best and the utmost that life on earth can yield?

In the light of our answers, tentative though they must be, to these questions, we can see the purpose of education. It is to integrate the character of every man and woman: to develop in each person a single wide interest that shall fit him for some particular walk in life, and for realising his own best self in this way of serving God.

J. C. M. G.

OXFORD

October 1939

¹ Cambridge University Press, 1921.

² The Report of the Consultative Committee of the Board of Education on *Secondary Education with special reference to Grammar Schools and Technical High Schools*, 1938.

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CHAPTER 1

THE PROBLEM

§ 1. PRINCIPLES AND PRACTICE

NEARLY ninety-nine million pounds of public money were spent on the schools of England and Wales during the year ending on 31 March 1939.¹ Many millions more, but no one knows how many, came from parents who paid fees and from the trustees of educational endowments.

For what purpose did the State and the local education Authorities, the parents and the pious founders provide all this money? What did they hope to get in exchange for it? In the first place, perhaps, 'a supply of fit persons to serve God in Church and State' as the old bidding prayer has it. And secondly, men and women who will realise their best selves in that service. More than a quarter of a century ago, the late Professor Sir John Adams² made a list of some fifteen statements of the aim of education. He concluded that 'there are two... that stand out from the others as embodying all the essentials, and as between them covering the whole field.... The first is *self-realisation*, the second *many-sided interest*. These have been frequently treated as antagonistic ideals, and each has its enthusiastic supporters. But...

¹ The sum of £98,882,000, made up of £51,072,000 from the Exchequer and £47,810,000 from the rates, represents the estimated net cost in 1938-39 of elementary, secondary and technical education, training of teachers and teachers' pensions etc., so far as these activities fall within the purview of the Board of Education.

² *The Evolution of Educational Theory* (1912), pp. 39, 40.

far from opposing each other they are really complementary. Neither can be attained apart from the other.¹

The aim of Herbart and his followers was to build up in each pupil a *many-sided interest*. In order to emphasise its essential unity and to avoid asking how many sides the interest is to have, we shall describe it as a *single wide interest*. According to the Herbartian theory, education can modify the natural development of any boy or girl. Indeed, the core of Herbart's teaching is that instruction supplies the only force that can modify character.² By building up single wide interests of different kinds in different individuals, the educator helps to produce men fit to serve each other and the community in many different callings.

Those who advocate *self-realisation* as the aim of education generally maintain that the pupil should be protected as long as possible from a cramping environment so that he may experience a free and full development, which is self-realisation. From Froebel's point of view, the educator's function is not to produce men to serve the community in this, that or the other capacity. It is rather to watch over and protect while the pupil freely becomes what his own nature makes him. It is true that, as he grows older, he should gradually become his own chief educator. In the university, at least, he should be allowed considerable freedom to choose the subjects he will study. Even in the university, however, he will do well to receive advice from his tutor or director. And the master or mistress in a secondary school not only must in practice, but also should in theory, prescribe the greater part of the pupil's studies. Rousseau himself, after giving Émile a private tutor all to himself (and so avoiding

¹ *Loc. cit.* pp. 39, 40.

² Adams, *loc. cit.* p. 326.

the difficulty of allowing each pupil in a school to select his own curriculum) made the tutor suggest the questions which Émile should ask. He thus interfered with Émile's natural development so as to make him become a particular type of man: in fact, an eighteenth-century dandy.¹

Some active interference with the natural development of his pupil is, indeed, demanded from every educator. Too much freedom in early youth leads to the formation of bad habits which leave the grown man anything but free. No man can realise his best self through selfishness. Whoever aims first at saving his life, loses it. To achieve complete self-realisation it is necessary to aim, in the first instance, at becoming fit for the service of others.²

If to achieve self-realisation and to build a single wide interest do, in fact, cover between them all the aims of education (except for quite young children whose interest in almost everything is innocent of order),³ we still want to know more precisely what effect all the public and private money, and all the teachers' efforts, spent on education are intended to have. If we ask what sort of a person is he or she whose interest is single and wide and who has achieved self-realisation, the answer is unlikely to be either simple or satisfying. The individual, we may be told, should possess character and intelligence, and a host of other qualities: comradeship, independence of mind, kindness, self-

¹ Adams, *loc. cit.* p. 178.

² Cf. Sir Cyril Norwood, when Master of Marlborough, on character-building in the Public Schools: 'In season and out of season we teach that the liberty we largely grant to our boys is to be used in the service of the common weal: that a boy must live for his society.' *The Times*, 5 June 1915.

³ Cf. William James: 'Childhood...has few organised interests.' (*Principles of Psychology*, Vol. I, p. 417.)

control, generosity, courage, honesty, humour, skilfulness in various directions but especially at one's job, knowledge (particularly of what is practically useful, including something of everything as well as everything of something), interests, culture, attitudes of mind, common sense, breadth of view, a sense of citizenship involving a desire for the common good and a readiness to make sacrifices in order to secure and maintain it, conscientiousness, purposefulness, 'the seeds of religion',¹ and much else beside.

Too often the attempt is made to achieve this complex ideal by teaching, it may be with great skill and unstinted devotion, each of several subjects on the school time-table, as if to know that subject, or those elements of it which can be learnt in school, were the whole aim of education for the time being. Too often we forget that, as Adams used to say, 'verbs of teaching take two accusatives, one of the subject and one of the person taught: *Magister Johannem Latinam docet*, and the master who teaches John Latin needs to know both John and Latin'. But John is complicated and difficult,

¹ Cf. the handbook of suggestions issued by the Board of Education: 'Enlightened aims in education are not peculiar to modern times. Since schools were first instituted some teachers in every age have taken as broad and liberal a view of education as the wisest men and women of to-day. Thus, we may quote a passage from the writings of Sir Henry Wotton (1568-1639) as an example in the best English tradition. It is a short account of what education embraces. "First, there must proceed a way how to discern the natural inclinations and capacities of children. Secondly, next must ensue the culture and furnishment of the mind. Thirdly, the moulding of behaviour and decent forms. Fourthly, the tempering of the affections. Fifthly, the quickening and exciting of observations and practical judgment. Sixthly, and the last in order, but the principal in value, being that which must knit and consolidate all the rest, is the timely instilling of conscientious principles and the seeds of religion.'" (*Handbook of Suggestions for the Consideration of Teachers and Others concerned in the work of Public Elementary Schools*, 1937 edition, p. 8.)

while the Latin is comparatively simple and easy. Small wonder then if John's education is not all that it might be. And yet the accumulated experience of schoolmasters who have been teaching the same subjects to English boys in the same schools for four hundred years does count for a great deal. By trial and error much has been learnt of the art of education, even if its science lags behind.

That is not to say that more might not be done with a hundred million pounds a year if educational practice were more generally and more firmly based on principles sustained by generally accepted theory. Such principles of education should explain what is the relation between the subjects taught in school and the effect each of them is intended to have upon the pupils. Our aims, we feel sure, are right; but our practice, despite its increasing success, might be further improved if only we knew more nearly how John's study of this or that subject helps to make him into the man we hope he will become.¹

The problem is the more urgent since the dictator States of Europe have set themselves to cast their future citizens in a particular mould, and are using all the resources of rigidly controlled systems of education in order to produce Communists, or Fascists, or Nazis. Here, for example, is a summary by Professor Seton-Watson of a circular² issued by the German Minister of the Interior, Dr Frick, to all his education authorities:

¹ Cf. the *Report of the Consultative Committee of the Board of Education on Secondary Schools*, 1938: 'The emphasis in educational theory has shifted from the subject to the child' (p. 143). This document is referred to below as the *Spens Report*.

² Circular No. III, 120/22. 6. The full text was published in *Nature*, 24 February 1934.

The document attempts to lay down certain 'directive principles' for the teaching of history. In the first place it stresses the significance of 'race' and 'nationality' (*der völkische Gedanke*) 'as opposed to the international idea, the creeping poison which has for the last 100 years been threatening to corrode the German soul itself'. The fate of Germany's kinsmen outside her borders must always be kept in evidence, and cultural history must not be given pre-eminence 'over the political history which shapes the fate of nations'. 'The heroic idea in its Germanic expression, associated with the idea of leadership of our own day, must penetrate historical teaching at all stages. . . . The heroic idea leads on directly to the heroic outlook on life, which especially suits us as a Germanic people.' It must then be demonstrated that 'the history of Europe is the work of peoples of Nordic race'. The history of the Greeks, and again of Italy, must 'begin in Central Europe': the decay of the Roman Empire is to be explained by the 'denordicising' (*Entnordung*) of Southern Europe: the *Völkerwanderung* (what we denordicised degenerates call the 'Barbarian Invasions') brought back blood into the degenerate hotch-potch (*Rassenmischmasch*) of the Empire and made possible the cultural revival of the Middle Ages. 'Only the fact that the German ruling class in Central, Western and Southern Europe was the bearer of medieval culture makes it possible to understand how medieval chivalry at its height exhibits everywhere such a uniform character.' The Middle Ages are praised mainly because they were 'a time of very great expansion of German power'. But in the modern period, despite the growth of nationalist tendencies, international influences also began to penetrate, and led to 'a lamentable intrusion of alien elements into German blood, speech, law, into the German conception of the state and finally into the general outlook upon the world'. This must be countered by the development of German national consciousness, by renewed emphasis on 'the bond of blood' and the community of the Nordic

peoples. 'The last twenty years of our own time must form the principal object of our study.' Versailles and Potsdam are contrasted—the degradation of the former leading to the 'collapse of the liberal-Marxist philosophy' and 'the triumph of the National Socialist idea of freedom'.¹

Seton-Watson comments on all this: 'In a word, history, like education, science and religion, is to become the handmaid of the all-embracing Party.' And Aldous Huxley adds, in his recent book *Ends and Means*: 'Truth and kindliness are held by a dictator to be virtues only in so far as they do not conflict with his aims.... He inculcates minor virtues, such as obedience, physical courage and fitness, but disparages the higher virtues, kindliness and love of truth, without which the minor virtues are merely instruments for doing evil with increased efficiency.'²

Let there be no mistake. We have no wish to copy the totalitarians in trying to shape all minds to the same pattern. But when the power of education is being so fully used by dictators to further their aims at the expense of ours, ought we not to make sure that the education given in our own and other free countries is marked not only by high ideals and skilful teaching but also by careful thought on how best to attain the one by means of the other? Without the aid of well-thought-out principles, practice cannot make perfect.

§ 2. A SCIENCE OF EDUCATION

We have then to look for principles to check our practice and perhaps to improve it. These principles, when we have found them, may extend a long way from the actual work of education towards the ideal purpose of it all. They may

¹ R. W. Seton-Watson, *Britain and the Dictators*, 1938, pp. 291-2.

² *Loc. cit.*

even throw some light upon that purpose itself and enable us to express it more simply and more clearly.

In years gone by the search for principles of education was roundly asserted to be both impracticable and undesirable. 'I'm not an educationist and I hope I never shall be' said a high official of the old Education Department, 'the greatest man who was ever in this Office' according to his colleague who told the story thirty years ago. Very different is the state of things to-day. The expansion of public education in England and Wales during the last forty years has indeed brought about a social revolution.¹ The change consists in more than 'expansion'. It extends to quality as well as to quantity. Teachers, local education authorities and the Board of Education are all alive to the need for such principles of education as will allow an ancient art to become a modern science.²

By a 'science' we mean a body of organised knowledge expressed in propositions which, with their logical consequences, every expert in that science accepts as 'true': that is, consistent with his own experience and with so much of other people's experience as he can disentangle from their descriptions of it. It is the faith of every science that an unlimited number of phenomena can be comprehended in terms of a limited number of such propositions, principles or 'laws'. The phenomena are explained as particular examples of the working of general 'laws'. But a scientific

¹ See *The Silent Social Revolution* (Oxford University Press, 1937), Mr G. A. N. Lowndes' 'account of the expansion of public education in England and Wales, 1895-1935'.

² A notable and most welcome summary of such principles, with proposals for their application in the field of secondary education, is contained in the *Spens Report* (see footnote on p. 5 above).

law is not a part of nature. It is only a way of comprehending nature, a hypothesis consistent with up-to-date experience. It can never be proved to be right. It can only be shown to be plausible. And it is not immutable, for it may have to be altered in the light of experience still to come.¹

The present essay seeks for general laws to comprehend or explain the practice of education. If the search seems difficult, or even hopeless, that is not a valid reason for refusing to embark upon it. M. Bergson has reminded us that tasks which seemed impossible to sedentary workers may nevertheless be accomplished by acts of faith. The impossibility of swimming might be demonstrated by one who should show that unless a man could float he could not swim and unless he could first swim he could not float; and yet this arm-chair logic is stultified by the action of the man of faith who, leaping in and struggling, finds that he can swim.

If we are to succeed in formulating principles that will fit and explain the practical experience of education, we must begin by abjuring the use—or, at least, the misuse—of metaphor. The prevalence of metaphors in the literature of education is responsible for much confusion of thought. The plain man will welcome and use a metaphor, even a mixed metaphor like the ‘broad foundation of general culture’, when he would never accept the theories it implies. He supposes that the metaphor states in plain terms a general principle of universal application. Its limitations are hidden from him by a change of metaphor when his author sees absurdities in the offing. ‘For many minds, to say “as the twig is bent so is the tree inclined” not only illustrates the

¹ Cf. Professor L. L. Thurstone, *The Vectors of Mind* (University of Chicago Press, 1935), pp. 44, 45.

aphorism "train up a child in the way he should go, and when he is old he will not depart from it", but actually proves it.'¹ Mr Stelling never realised that his whole system of education would have to be changed were he to regard Tom Tulliver's mind as an intellectual stomach with a delicate digestion instead of as a field to be ploughed and harrowed by such potent implements as etymology and grammar (to which poor Tom's mind was peculiarly impervious) so as to make it bear a prolific crop, whatever seed might afterwards be sown. 'O Aristotle,' adds George Eliot, 'had you been the freshest modern instead of the wisest ancient, would you not have mingled with your praise of metaphor a complaint that to-day we are seldom able to say what a thing is except by saying that it is something else!'

The 'broad foundation' metaphor has perhaps done more harm than any other. It has been widely used. Its sponsors were extremely respectable. Even the Consultative Committee of the Board of Education wrote in their *Report on Examinations in Secondary Schools*:

Every Secondary School should provide, for pupils up to an average age of sixteen, a sound basis of liberal education, which, though not necessarily of the same type in all schools, would serve as a foundation upon which varieties of further education could be based.²

In their next report the Committee repeated:

It must...be held to be one of the functions of the Secondary School...to provide those of its pupils whose future callings may involve manual work...or the utilisation

¹ Adams, *loc. cit.* p. 286.

² *Report* (1911), p. 104.

and control of such work with a foundation on which technical instruction may subsequently be built.¹

If this building metaphor be considered merely as a metaphor, it is inferior to the plant metaphor of Pestalozzi and Froebel. Indeed 'in the case of the Plant Metaphor which has had such a wide influence in modifying views of education... it may almost be said that we are not here dealing with an analogy at all, but with a type. The plant does not merely stand for an organism. It is an organism. If it be asked why, in that case, it is necessary in order to illustrate the development of the child, the answer is that the child as possessing self-consciousness is an organism of a higher grade than the plant, is in fact a hyper-organism.... *Organism* is a better metaphor by far than *machine*; but it is a metaphor, and an inadequate one in every way.'² The *building* metaphor is even worse than *machine*. It involves the heresy of the passivity of the pupil, 'one of the most pestilent heresies in education'.³ Its result in practice has more often resembled a lot of loose stones than a solid foundation; for it has led examining bodies to demand knowledge of several separate subjects. In order to give their pupils the best possible chance of passing, the

¹ *Report on Practical Work in Secondary Schools* (1913), p. 5. As we shall see in our last chapter, the latest Report of the Consultative Committee (the *Spens Report*) has no further use for this metaphor. On the contrary, the Committee point out that 'considerable ambiguity attaches to the term "general education"' as well as to 'faculty training... which assigned each faculty to a separate subject', so that every one of these subjects had to be included in the ideal 'general education'. The Committee add: 'the term "general education"... can hardly convey any clearly defined meaning so long as the problem of education in Secondary Schools is approached from the point of view of the subjects'—the loose stones supposed to make a broad foundation—'rather than from that of the development of the pupil as an individual' (*loc. cit.* pp. 70, 71).

² Adams, *loc. cit.* pp. 285, 286.

³ Adams, *loc. cit.* p. 18.

schools arranged to have those subjects taught by independent specialists. The form-master, who specialised in his boys, got pushed into the background. Yet Milton held that 'the greatest mistake is in teaching subjects in water-tight compartments'.¹ And Goethe took the same view. 'Thorough knowledge of one subject and practice in it', he wrote, 'produces higher culture than incomplete knowledge of a hundred subjects.'² From France also comes the warning 'that we ought to abstain from dividing and parcelling (*morceler*) what nature has made one and indivisible'.³

It would not be fair to lay all the blame for the subdivision of school studies upon the supposed need for a 'broad foundation' on which any sort of superstructure may afterwards be built. Part of the trouble may be traced to the doctrine that knowledge is of value 'for its own sake'; and that, therefore, as much knowledge as possible ought to be acquired by everybody. We shall find many reasons for denying that one of the objects of education is the acquisition of knowledge 'for its own sake'. People should be talented as well as learned. Mr Gradgrind was wrong in saying that 'what we want is facts', and meaning that he preferred the knowledge about horses possessed by one child, who could not behave intelligently⁴ in the presence of horses but could quote a long definition beginning 'Quadruped graminivorous', to that of another who, although unable to define

¹ Quoted in a presidential address to Section L of the British Association, *Nature*, October 1914, p. 131.

² Quoted by Dr Georg Kerschensteiner, *The Schools and the Nation*, p. 256.

³ A. Bertrand, *L'Enseignement Intégral*, p. 53. Quoted by Adams, *loc. cit.* p. 190.

⁴ Cf. Adams, *loc. cit.* p. 198.

a horse, had spent her whole life with a travelling circus. We should make the same mistake were we to attach too great importance to the mere knowledge of isolated facts that can be produced to satisfy examiners.¹ Unless, in Herbert Spencer's phrase, we 'turn fact into faculty', unless our knowledge makes us *act* differently, it is of no value to us. There is no use in knowing all good, even 'the best that has been known and said in the world',² if we are not educated to seek the highest when we see it.

Any inquiry into the principles of education must try to solve this problem of the relation of knowledge to character. The present book is no exception. As to its method, we have said that metaphors are to be banned for the sake of clearness and precision. On the other hand, we shall have to invent and use some new words so as to avoid vagueness and make our meaning clear. Esoteric or symbolic language needs no excuse, since, without it, accurate thought about the phenomena of nature would be much more difficult than it is. A reader or hearer will be likely to mistake the meaning of words like character, culture, imagination or interest, so long as they are used every day in many different senses.³

¹ Cf. the *Spens Report*: 'It is not what a pupil knows but what he does and how he lives that really matters' (p. 171); and again, 'The value of information has been grossly exaggerated in all systems of education' (p. 172).

² Matthew Arnold's definition of culture: *Literature and Dogma*, xiii (1876).

³ Cf. Professor William McDougall, F.R.S.: 'When we come to describe the facts of consciousness we find that the notions and the words in popular use are very inadequate to the work of analytic description... the greatest authorities have not yet learnt to use the same descriptive terms or to apply the same terms in exactly the same senses.' (*Psychology*, pp. 42, 47.)

After seizing upon the facts themselves, instead of upon quite different facts suggested by a metaphor, and after expressing the true facts in unequivocal even if technical language, the third step towards the formulation of principles is to *select* from among the vast mass of available material a limited number of facts to be linked together by means of a generalisation. The selection of the simplest facts and their relation to one another by means of wide generalisations is, according to one of the greatest of mathematicians,¹ the method by which all systematic knowledge of natural science has been built up. By the same method we instinctively acquire such organised knowledge as we possess of the world in which we live.

The selection of certain facts will involve ignoring others. To some of these other facts we may afterwards return and relate them to our organised body of knowledge by means of other secondary generalisations; further sets of facts may then be related to these; and so on. Moreover, as Poincaré has pointed out, it is of the first importance that the facts selected for linking up by the earliest generalisations shall be *simple*² facts, simpler perhaps than can be directly perceived by our senses. A direction and position in space, represented by a line having length without breadth or thickness, is an example of such a simple fact. It is just the kind of fact we need to begin the systematic study of any material object, whether the leg of a table, the continent of Europe, or the Dresden Madonna. And this remains true, in spite of the entire absence of a line as we have

¹ Henri Poincaré, *Science and Method*, pp. 17, 18.

² *Loc. cit.* p. 18.

defined it from any of these objects as apprehended by our senses.¹

In short, we are accustomed to think—and this is the more true the more precise we want our thinking to be—not of things as they really are, but of simplified and organised representations or abstracts which, for the purpose in hand, correspond in all essential respects with more complex sense impressions of those things. Such abstracts are more easily and more accurately reasoned about than the more complex sense impressions. If we wish to determine the area of a triangular field, we do not think of the field with its crop of wheat, its boundary hedges, its sandy soil, its flatness, its view of the sea, its summer heat and its winter cold; but we think of an imaginary triangle having more in common with the plan of the field in the title deeds than with the field itself as it appeals to our senses. And the reason is given by Bergson: ‘Whatever is geometrical in things is entirely accessible to human intelligence.’²

§ 3. MIND AND BRAIN

For accurate and easy thinking about education it is necessary to make use of the same method: to *select* the facts about which to think and, above all, to choose facts which are *simple*, even if imaginary like the line which represents the

¹ Cf. Dr Bernard Hart: ‘Atoms are merely constructions of the scientific imagination.... The ether and its waves have never been observed in nature, they have been invented by the scientist in order to explain the facts of light and heat. But their actual non-existence does not in the least vitiate the value which they have for science. They enable us to resume and predict a vast number of facts, and this is the sole justification which a scientific law is ever required to possess.’ (*The Psychology of Insanity*, p. 15.)

² *Creative Evolution*, p. 200.

direction of a hedge. Thus, in formulating principles of education, we shall for the most part focus our attention upon the comparatively simple material aspects of the brain, rather than upon the mind or soul of the person being educated. This procedure implies no low material view of education. It does not suggest that education is concerned with the central nervous system rather than with the soul, although it recognises that the soul can only be reached by human educators through the brain of the pupil. Nor does it assume that we know more of the brain than we do of the soul: the contrary is more likely to be true. But

even when—as, in fact, commonly happens—the amount of relevant physiological information hitherto definitely ascertained is small, even then the physiological standpoint, highly speculative though it must necessarily be, would still appear the more illuminative and progressive.¹

Indeed, as Sir Henry Head has pointed out in his great work on *Aphasia*,² the states of mind revealed by introspection are ‘categorical abstractions’. Although sensations, images, and the like, appear when the mind examines its own activities ‘they are not portions of an integrative reaction’. The final thought follows from the brain processes but not necessarily from the intermediate thoughts.³ ‘The field... open to introspection is limited to the phenomena of consciousness.’ But many mental processes are not included among these phenomena. Head’s researches into the effects produced by injuries to the brain ‘reveal a multitude of processes which participate in the response’, or influence the end of a train of

¹ Professor C. Spearman, F.R.S., *The Nature of Intelligence*, 1927, p. 131.

² Cambridge University Press, 1926. The references are to pp. 545 and 549 of Vol. I.

³ Cf. experiments described by Spearman, *loc. cit.* p. 192.

thought, although they 'do not form part of the continuum of consciousness' and are not normally open to introspection.

When we describe the working of the mind in terms of brain processes we act on a suggestion of T. H. Huxley. In his view, 'there can be little doubt that the further science advances, the more extensively and consistently will all the phenomena of Nature be represented by materialistic formulae and symbols'.¹ Bergson states the same truth more fully. '*The intellect*', he writes, '*is characterised by a natural inability to comprehend life.*'² And again, 'The intellect is at home in the presence of unorganised matter. . . . Now, when the intellect undertakes the study of life, it necessarily treats the living like the inert, applying the same forms to this new object, carrying over into this new field the same habits that have succeeded so well in the old; and it is right to do so, for only on such terms does the living offer to our action the same hold as inert matter. But the truth we thus arrive at. . . is no more than a *symbolic* verity. It cannot have the same value as the physical verity, being only an extension of physics to an object which we are *a priori* agreed to look at only in its external aspect. The duty of philosophy should be to intervene here actively. . . .'³

And when we reason about material things, there is less danger of going astray 'between the moment when we meet a proposition for the first time as the conclusion of one syllogism, and the moment when we find it once more as the premise of another syllogism',⁴ because we easily forget

¹ *Collected Essays*, Vol. I, p. 164, quoted by Dr W. Temple, Archbishop of York, in *The Nature of Personality* (p. 2).

² *Loc. cit.* p. 174. Bergson's italics.

³ *Loc. cit.* p. 206.

⁴ Poincaré, *loc. cit.* p. 48.

the meaning of an *abstract* proposition. Our reasoning is therefore more likely to be accurate if, without by any means regarding the brain as merely a material thing, we focus our attention upon its material aspects. Then will our conclusions follow more certainly from our premises, and a comparison of these conclusions with observed facts will show us more plainly if our premises or hypotheses are wrong.¹ And if our conclusions accord with all the observed facts, we shall feel the more sure of the truth of our premises and of any other conclusions we may draw from them.

For these reasons we shall, as far as possible, employ 'materialistic formulae and symbols' in this inquiry. While, however, we recognise and make use of the fact that 'all mental phenomena are accompanied by a physiological phenomenon',² and while we choose to imagine the latter, rather than the former, in our discussions, we need not suppose that, if we could completely describe the structure of the nervous system of any man or animal and had a complete knowledge of the laws of the physical and chemical processes that occur in it, we should be able to account completely for all the conduct of that individual. In fact, we shall not follow Huxley in regarding consciousness as no more than an 'epiphenomenon' caused by the play of nervous processes in the brain but neither modifying those processes nor reacting upon them. Nor shall we accept the view that the processes of mind and brain run parallel to each other but never meet or interact, the doctrine of psycho-physical parallelism. We prefer to take what Professor William

¹ In other words, we shall be more likely to discover our mistake if we attribute imaginary properties to the brain than if we erroneously imagine properties of the mind or soul.

² Alfred Binet, *The Psychology of Reasoning*, p. 12.

McDougall called 'the old common-sense view' that psycho-physical interaction does in fact take place, 'that soul and body, or psychical and physical processes, interact or react upon one another, so that psychical processes play a part in determining conduct'.¹

¹ W. McDougall, *Physiological Psychology*, p. 8, to which reference may be made for a summary of the argument for 'psycho-physical interaction' as against 'epiphenomenalism' and 'psycho-physical parallelism'. This little masterpiece has been reprinted many times, but never altered, during the thirty-three years before McDougall's death in November, 1938. A fuller statement is given in *Body and Mind* by the same author.

CHAPTER 2

AIMS OF EDUCATION IN THE PAST

JOHN STUART MILL, in his rectorial address to the University of St Andrews (1867), defined education as including 'whatever we do for ourselves, and whatever is done for us by others, for the express purpose of bringing us somewhat nearer to the perfection of our nature; it does more: in its largest acceptance it comprehends even the indirect effects produced on character, and on the human faculties by things of which the direct purposes are different; by laws, by forms of government, by the industrial arts, by modes of social life; nay, even by physical facts not dependent on human will, by climate, soil, and local position.'¹

According to this definition education includes all those influences that operate upon the person being educated from outside himself and so modify his nature. But for practical purposes the definition is too wide, as Mill was well aware. What we commonly call education is 'that education in which man intervenes.'²

It is a bi-polar process in which one personality acts upon another in order to modify the development of that other. The process is not only a conscious but a deliberate one. The

¹ Quoted by Adams, *The Evolution of Educational Theory* (1912), p. 10. To Adams' work I am indebted for much that appears in this chapter.

² Huxley, *Collected Essays*, Vol. III, p. 85. Quoted by Adams (*loc. cit.* p. 30), who distinguishes between this *human* education and that *cosmic* education which consists of wider processes wherein no human educator takes part.

educator has the clearly realised intention of modifying the development of the educand.¹

In prehistoric times, and among the primitive communities with which history begins, individual habits and social customs differed but little from one generation to another. Evolution was a slow process in those days. As was the father, so was the son. Every individual's walk in life could be foreseen with small risk of error. It was the function of such education as he received to prepare him for his particular walk in life. 'All early education is a direct preparation for the life work of the individual concerned. It is an education *ad hoc*. . . Education begins by being specific.'² The idea of a general education which should fit the educand for any walk in life to which he might happen to be called arose comparatively late in the evolution of educational theory.

We must distinguish here between specific education—preparing the educand for his whole life-work, social as well as vocational—and what is technically known in schools as specialisation. 'Specific education historically precedes while school specialisation historically succeeds the development of the theory of a liberal education. Specific education is the form that naturally appeared as soon as humanity rose to the possibility of passing on its gains from generation to generation. The child was brought up to do what its parents found it necessary for them to do in order to carry on life successfully. With the coming of the conception of a liberal educa-

¹ Adams, *loc. cit.* p. 39. Educand is Adams' term for the person being educated. We shall use it in this chapter so as to avoid calling the same person by several different names—child, pupil, student—as he or she goes from one school to another and on, perhaps, to a university.

² Adams, *loc. cit.* pp. 162, 163.

tion there was a tendency to a certain rigidity of curriculum because of a natural desire on the part of every one to insist on having only those elements that were generally recognised as constituting the really free training.¹ On the other hand, school specialisation consists in the manipulation of the elements of this rigid curriculum, often without reference to the life-work of the educand. Thus a boy who intends to study science or medicine at the university may specialise in classics at school on the ground that 'the classics develop the power of sustained and orderly thinking';² or another may specialise in mathematics at school and at college in order to win a place in the Indian Civil Service and so administer laws in India.

The specific education of early times was passed on from parent to child or was acquired by the educand for himself in the mere process of living. It is only in modern states and in very recent times that the education of every inhabitant has been deliberately planned. But even among primitive peoples it soon became usual for the education of the rulers to be given them deliberately, while other people were left to make shift with what education they could find for themselves. The education given to future rulers aimed specifically at preparing them for the whole of their life-work. And, since whoever was well educated as prophet, priest, or king must have had his whole nature concerned in the process, no distinction was apparent at the earliest stage between the vocational and social aspects of specific education.³

The education of the twenty thousand cultured Athenian

¹ Adams, *loc. cit.* pp. 178, 179.

² Quoted from Dr Alex Hill (formerly Master of Downing College, Cambridge) by Adams, *loc. cit.* p. 211.

³ Cf. Adams, *loc. cit.* pp. 182, 183.

citizens of the time of Socrates was still within the region of the specific. They were, in fact, specifically prepared for their life-work of cultured leisure.¹ Theirs it was to govern and defend their city-state, as well as to understand and direct the work of the swarming slaves among whom were some of the finest craftsmen the world has ever seen. The 'liberal' education of the free citizen of Athens was wide enough to fit him for the performance of these manifold duties. But it did not include subjects—Sanskrit, for example, or Egyptian art—which, while having no bearing upon the work he would be called upon to *do*, he nevertheless required to *know about* in order to be recognised as 'cultured'.² At this stage the specific education that best prepared the free man for his life-work as a citizen was not distinguished from the training that best developed him as a man. The vocational and social aims remained one and the same. But we must not forget that the educational theory here in question was concerned only with the education of the citizens who counted. The slaves were specifically trained for their several occupations. Relatively to that of the slaves, the education of the free citizens was a general education. The specific education of the free man was, in fact, the most general education ever practised or conceived.

¹ Adams, *loc. cit.* p. 183.

² Cf. Professor A. N. Whitehead, F.R.S.: 'Classical learning has had its moments of triumph. It triumphed with radiant genius in Athens during the age of Pericles, a genius so splendid as to beget the theory that all subsequent ages should bend their intellectual activities to the parasitic existence of contemplation of this radiance. But this was a triumph of modern learning.... Happily for mankind there were at Athens no schoolmasters to impress upon them that the only wisdom was to be found among the Egyptians. Herodotus was a modern of the moderns.' (*Address to the Education Section (L) of the British Association*, Bournemouth, 1919.)

In medieval Europe, as in ancient Athens, the training of the people for the practice of industrial or artistic crafts had little relation to the education of those who were to rule in church or state. Indeed, the noble and the learned clerk would probably have been unwilling to concede that the apprentice who could not read or write had received any education whatever. Education was still the preserve of the rulers of the people who were prepared for a wide kind of life.

But the growing complexity of social organisation broke up the ancient unity that marked the life-work for which old-time rulers had been educated. The specific education provided in the grammar schools and universities for those who intended to take Holy Orders or to follow the profession of law was in the hands of the clergy. This was a bookish education, Latin being the basis of the curriculum. 'For the children of the aristocracy . . . a more elaborate form of social training was in vogue. This included much training of the body and of manual aptitude in those arts and exercises which were practised in the daily life, in the duties and in the amusements of the nobility and courtly families. At the time of the Italian Renaissance, this type of knightly or courtly education became highly developed and elaborate.'¹

The cleric from the university and the courtier from the palace school might both claim to have received a general education. Each had, it is true, been specifically educated for a different walk in life; but their training had not been specialised. The former had studied the seven liberal arts; while the 'sons of the nobility and higher gentry were able to study whatever subjects their intelligent parents chose to select for

¹ Report of the Consultative Committee of the Board of Education on *Practical Work in Secondary Schools*, Appendix B, p. 132.

them, and thus secure a clear advantage for their future life by this specific education'.¹ But while 'the finished courtier that Castiglione describes was no doubt free of all the great courts of Europe, . . . he would have cut a less creditable figure in the circle of scholars at a university. It was the increase in the numbers of spheres in which a man could claim to be generally educated . . . that led to the development of [a still more general education,] a new opposite to specific education, an education that was not intended to prepare a man for this, that or the other sphere, however wide, but just to enable him to become a complete all round man, a man who was not educated for this or that, but who was just educated, that and nothing more.'²

The growth of this theory of a general education that was to fit a man, not for this or that sphere of life, however wide and satisfying, but for any possible sphere that might claim him—not even for actual life at all, but for a sort of potential life³—was due to several causes.

In the first place it appealed to those writers who dealt definitely with the theoretical aspects of education. 'The tendency of the educational theorist is to erect for himself a typical educand, and then set about finding the best way to educate him as a mere human being, apart altogether from any consideration of the particular rôle that the educand may have to play in life. . . . The theorist sets up before him an ideal of pure cultural education, something that will fit a man to fill any post to which he may be called.'⁴ And yet, when we examine the writings of the theorists with some care, we find that 'each of them has in view some more or

¹ Adams, *loc. cit.* pp. 165, 166.

² Adams, *loc. cit.* p. 184.

³ Cf. Adams, *loc. cit.* p. 183.

⁴ Adams, *loc. cit.* pp. 176, 177.

less definite type of man, and that their theories are directed towards the moulding of the educands on this model'.¹

Another reason for the wide acceptance of the new theory of general education was its consistence, if not its confusion, with the evident fact that there are certain instrumental subjects, such as was Latin in the Middle Ages, that every educand must study as a preparation for those further studies that would specifically prepare him for his walk in life. It was not that Latin was supposed to produce an effect on the soul that made it ready to receive the seeds of culture; but, quite simply, that Latin was the medium in which all higher education was then conducted. In Latin the books were written; university lectures were delivered in Latin; and Latin was the language of the church.

Then again the idea of a general education, quite independent of the lives which the educands might expect to lead, simplified the school curriculum at a time when it tended to become intolerably complex. So long as specific education was still practically universal, the only way to adapt school education to the growing variety of careers that were becoming open to the educands was to add to the curriculum every subject which might help to prepare for any one of these careers. The increase of knowledge, brought about by the revival of classical learning and the beginnings of natural science, added further to the volume of school studies. Even in Milton's ideal school which still aimed at specific preparation for a particular walk in life—that of a

¹ Adams cites the cases of Milton, Locke, Chesterfield, Montaigne, Rousseau, Pestalozzi and Herbert Spencer in support of this statement. (*Loc. cit.* pp. 177, 178.)

sturdy and cultured squire of the Commonwealth¹—the school course extended over nine strenuous years, and had to be followed by further specialised courses for those who wished to qualify for the professions of law or medicine or theology. At this rate, 'encyclopaedic instruction soon became impossible'.² The necessary relief was afforded by the theory of a general education, an education *in vacuo*. And this relief was the more welcome when it became a question of educating the masses of the people for their almost infinite variety of different occupations as well as for their leisure and their common life as citizens.

So the schools came to offer a general education more or less divorced from any attempt to prepare the educands for their future activities, whether vocational or social. There could be no valid objection to this in so far as it meant that schools which prepared the educands, not directly for life itself, but for specific courses in the universities, confined themselves to those instrumental subjects without which the further study was impossible. The general preparatory courses provided in the Arts Faculties of the universities were equally defensible.

In fact, however, the universities gave up specific education no less readily than did the schools. But, as the professions which university men entered were already controlled by university men who readily accepted university standards in appraising qualifications, questions concerning the suitability of university education as a preparation for these walks of life did not easily arise.

The case of the schools was different. Even those schools

¹ Cf. Adams, *loc. cit.* p. 177.

² Adams, *loc. cit.* p. 208.

which professed to prepare for the universities¹ must have been attended by many pupils who did not afterwards receive a university education. There were also many schools which made no such profession, but passed all their pupils directly into practical life. The parents or employers of these pupils, brought up perhaps in a different tradition, naturally inquired what the schools had done to prepare their pupils for the life which followed school. A defence had to be found, and it was ready to the hands of the schoolmaster in his theory of 'formal training':² namely, that the soul possessed a number of faculties (of memory, of observation, of invention, and the like) each of which could only be developed, or at least could best be trained, by the study of certain appropriate subjects at school, so that the omission of any one of these subjects would stunt the development of the soul and maim the personality. Formal training was thus a simple and by no means abstract conception which critics of what appeared impractical in school curricula were ready enough to accept, the more so since the truth of the doctrine could not be easily tested. Indeed it is only in the twentieth century that experimental psychologists have succeeded in showing that this doctrine does not fit the facts.³ Already in 1912

¹ 'The Secondary School... began in medieval times as a preparatory school for the university, and this quality it has never lost: indeed, in some respects it has reinforced it.' Mr Kenneth Lindsay, Parliamentary Secretary to the Board of Education, in the House of Commons on 20 June 1938.

² Adams, *loc. cit.* p. 209.

³ Cf. Professor Cyril Burt's *Historical Note on Faculty Psychology* on pp. 429-38 of the *Spens Report*.

The *Spens Report* observes that the Board of Education were 'chiefly influenced by the now discarded "faculty" psychology' (p. 70) when they required, in their Regulations for Secondary Schools, 1904-5, that 'a sound general education' be given in all grant-aided secondary schools.

Adams was able to write: 'The balance of expert opinion is now so solidly against the dogma of formal training that as an educational force it must be regarded as moribund.'¹

What then? As the dogma of formal training becomes discredited, its opposite—specific education—comes back to take its place as the most widely accepted theory of education. According to Adams, 'the whole evolution of educational theory may be said to be a great sweep from specific education back again to specific education, through a long period during which formal training held the field'.²

The *Report* adds: 'We cannot but deplore the fact that the Board did little or nothing after the passing of the Education Act of 1902 to foster the development of secondary schools of quasi-vocational type designed to meet the needs of boys and girls who desired to enter industry and commerce at the age of 16' (pp. 72, 73).

¹ Adams, *loc. cit.* p. 222, where references are given to some of the literature. Further references appear below.

² *Loc. cit.* p. 225.

CHAPTER 3

NEUROLOGY

OUR summary of Adams' account of *The Evolution of Educational Theory* has had nothing to say of Physiological Psychology. Indeed, the work of physiologists and anatomists has had little influence upon educational theory. Neurology is seldom discussed at teachers' conferences, or in the administrative offices of education authorities. Neurograms are scarcely mentioned in educational literature.

Our inquiry is to be free from these restrictions for the reasons already given.¹ Another reason is that 'many recent advances in psychology are directly due to physiological observations'.² In fact, as McDougall adds,

our mental life is intimately bound up with, and to a great extent conditioned by, the processes of the nervous system, and therefore cannot be understood without the aid of knowledge of those processes. . . . And it may be confidently predicted that psychology will cease to be regarded as a purely academic study, and will be recognised as providing the only true sound theoretical basis for the art of the teacher. . . . in proportion as it becomes a truly physiological psychology.³

We shall therefore make all the use we can of physiological psychology in our search for laws and principles of education.

¹ See above, pp. 16-18.

² W. McDougall, *Physiological Psychology*, p. 12.

³ *Loc. cit.* p. 12. Cf. also Professor E. D. Adrian, F.R.S.: 'Whatever our views about the relation of mind and body, we cannot escape the fact that there is an unsatisfactory gap between two such events as the sticking of a pin into my finger and the appearance of a sensation of pain in my consciousness. Part of the gap is obviously made up of events in my sensory nerves and brain and the psychological method by itself can tell us nothing at all about these events.' (*The Basis of Sensation*, 1928.)

To every thought that passes through my mind, to every feeling or 'urge' of which I am conscious, and even to every reflex movement that I may make unconsciously, there corresponds some sort of disturbance travelling swiftly along a series of my nerve elements and comparatively slowly crossing the junctions between successive elements in the series; and each different thought or feeling or movement involves a different series of nerve elements—different, at least, in some of its units.

These nerve elements,¹ or *neurones*, consist for the most part of relatively long axis cylinders or 'nerve-fibres' projecting from a central nucleus or cell-body.² Each neurone is separately nourished by its own cell-body. It is seldom if

¹ This chapter's brief account of some of the principal features of the nervous system will, it is hoped, enable the general reader sufficiently to understand the physiological terms—the materialistic formulae and symbols—which we shall employ. But every reader who has not made a special study of the nervous system would do well to acquire at least so much information as is given in McDougall's attractive primer of *Physiological Psychology*. A general description and figures of the gross anatomy of the nervous system are to be found in many text-books of anatomy and physiology.

² Cf. McDougall: 'The neurones are of various shapes and sizes, but each one consists of a nucleus, which with a certain amount of protoplasm surrounding it constitutes the cell-body, and one or more delicate protoplasmic processes [or projections] continuous with the cell-body. In many neurones one of these processes is much longer than the rest and is called the axis-cylinder process or *axon*. All the nerve-fibres of the peripheral nerves are axons of neurones. The axon, in most cases, has for its protection a delicate sheath of fatty matter known as the *medulla*, and in many cases it is of great length, those, for example, which run from the spinal chord to the ends of the toes of a tall man are several feet in length. Some axons give off at short intervals a number of branches or *collaterals*, which connect them to numerous other neurones. The other processes of the body are generally shorter and much branched; they are known as *dendrons* because in many cases a single large process of this kind divides, like the stem of a tree, into many branches ending in a great number of twigs.' (*Loc. cit.* pp. 24, 25.)

ever continuous with its neighbours. But, on the other hand, it is no more independent of them than a human individual is independent of the society in which he lives. If his neighbours degenerate and die, he is likely to do the same. While each neurone is thus a separate trophic unit, it is not a separate functional unit. The functional unit of the nervous system is a 'nervous arc': a series of two or more neurones placed end on to one another and capable of conducting a 'nervous impulse' from one to the other across the junction, or *synapse*, between them. The neurones, bound together and supported by connective tissue and finely branching neuroglia cells, constitute the nervous system.

The nature of the disturbance transmitted by the neurones or across the synapses between them is still uncertain. In the nerve-fibre or axis-cylinder it is called a 'nervous impulse', and probably consists in a progressive 'partial decomposition of some very complex and unstable molecules',¹ which are essential constituents of the neurones. It is indeed 'the sole and invariable functional property of nerve-fibres to conduct "impulses", each of which is indicated by its electrical disturbance'.² In the outlying nerves on which experiments have been made 'this electrical change seems to be a universal accompaniment of the impulse, it can be used as a sign of its presence, as a measure of its size.... At any given instant a certain length of the nerve, of the order of a few centimetres, is found to be the site of a wave of negative potential....

¹ Adrian and Zotterman, *Journal of Physiology* (1926), Vol. LXI. Sir Henry Dale has described the nervous impulse as 'a self-propagating wave of reversible physico-chemical change' (*Journal of the Mount Sinai Hospital* (1938), Vol. IV, p. 401).

² Creed, Denny-Brown, Eccles, Liddell and Sherrington, *Reflex Activity of the Spinal Chord* (1932), p. 2.

The amplitude of this wave is a few hundredths of a volt: it moves at a speed depending on the nerve and the temperature—anything from 5 centimetres to 100 metres per second. We are probably right in thinking that the impulse itself, whatever it is, occupies the same region, and moves at the same speed, as its electrical accompaniment.’¹

There appears no reason to doubt that in the brain and in the spinal chord, as well as in the outlying sensory and motor nerves, all nervous impulses are accompanied by quick changes of electrical potential. If this be so, it follows that the nervous impulses accompanying every thought that flits across the mind must give rise to electro-magnetic waves. These waves spread throughout all space. It is conceivable that a wave of this kind, as it passes through another person’s brain, might give rise to nervous impulses and so produce a telepathic effect in that other person’s mind.

‘So long as the strength of the stimulus suffices to excite a nerve-fibre, the size and velocity of the impulse in that nerve-fibre are entirely independent of the strength of the stimulus. So likewise when the stimulus is repeated frequently, this independence still obtains, provided always that a sufficient period is allowed for recovery from the effects of the passage of the nervous impulse. The nerve-fibre always gives its maximal response or nothing at all. This constitutes the “all-or-nothing principle”, a fundamental rule in the activity of all nerve-fibres.’² When an impulse has travelled along a nerve-fibre, a certain period of recovery—some six-thousandths of a second in warm-blooded animals—must elapse before another full-sized impulse can pass, so that nervous impulses ‘cannot

¹ A. V. Hill, *Chemical Wave Transmission in Nerve* (Cambridge University Press, 1932).

² Creed and others, *loc. cit.* p. 3.

fuse into a steady flow, like the conduction of water in a pipe or an electric current in a wire, but may be compared to the repetitive discharge of bullets from a machine gun'.¹

Delay occurs when a nervous impulse, or a volley of impulses, reaches a synapse. 'We may confidently believe that in the great majority of synapses there is no simple continuity of substance, but a breach of continuity, or a difference in the nature of the nervous substance, which prevents the passage of the nervous impulse in the form in which it travels along the nerve-fibres, and renders that passage more difficult. This peculiarity of the synapses may conveniently be expressed by saying that each synapse presents a certain resistance to the passage of the impulse.'²

It is probable that, on arriving at a synapse, each impulse releases a chemical stimulant³ which excites the next neurone.⁴

¹ Creed and others, *loc. cit.* p. 4.

² McDougall, *loc. cit.* p. 28. His description of the structure of synapses is as follows: 'A simple kind of synapse is formed by the division of the end of an axon, or of one of its collaterals, into a number of fine twigs that surround the cell body of another neurone and terminate in tiny knobs lying close to, or perhaps in contact with, that cell body. Others are formed by the minute terminal branches of an axon or a collateral becoming intertwined with the branches of a dendron of another neurone or, in some cases, perhaps, with similar fine terminal twigs of the axons or collaterals of another cell. In many cases the terminal twigs of several axons surround one cell body or are intertwined with the dendrons of a single neurone.' (*Loc. cit.* pp. 27, 28.)

³ Acetylcholine, identified by Sir Henry Dale in 1934.

⁴ Dale writes: 'We might picture the impulse... as reaching the ending of a preganglionic [or pre-synapse] fibre, where... the release of a small charge of acetylcholine... would act as the immediate stimulus to the discharge from the ganglion cell [synapse] of a secondary, similar impulse propagated along the postganglionic fibre.' (*Loc. cit.* p. 420.) But it is still uncertain whether it is in virtue of its electrical charge or because of its chemical constitution that whatever crosses the synapse activates the secondary or postganglionic neurone: see D. H. Barron and B. H. C. Matthews, *Journal of Physiology*, Vol. xcii, No. 3 (1938), p. 315.

If the excitation is sufficient, an impulse or a volley will pass along the second neurone without decrement from start to finish, but neither the amplitude nor the velocity need be the same as before.

An arc, or a system of arcs, that is transmitting nervous impulses is said to be 'excited'. The 'excitement' consists of the impulses passing along the nerve-fibres and of the effects crossing the synapses. The 'intensity of the excitement' or the 'flow' at any point are terms we shall use to denote the measure of the transmission past that point in unit time. When the intensity of excitement arriving at a synapse between two neurones is just sufficient to cause an impulse to pass along the second neurone, we shall call this intensity the 'threshold' of the synapse. But this threshold is not a fixed quantity. It depends on the general health of the body. It tends to be raised by fever or anything which lowers physiological vitality.¹ It is raised temporarily by fatigue, as excitement continues to pass the synapse. And it is probable, as we shall see on p. 51 below, that the thresholds of many, if not of all, synapses tend to be permanently lowered by the previous passage of excitement across them.

The excitement of a nervous arc generally begins with the stimulation of a sense-organ and generally ends with the movement of a muscle: the normal path is from a sense-organ to a muscle. In the ideally simple case we may imagine that only two neurones are concerned, one sensory or

¹ Cf. Head, *Aphasia*, Vol. 1, part IV, ch. 1: 'A common cold, a gastro-intestinal attack or even mental worry may materially diminish any form of mechanical skill' by raising the thresholds of the synapses (Vol. 1, p. 487).

'afferent',¹ the other motor or 'efferent'; and these two together form a 'sensori-motor arc', the functional unit of the nervous system.

In the higher animals and in man we must distinguish two systems of muscles and two corresponding systems of sense-organs. The one system of muscles is attached for the most part to the bones of the skeleton, and the contractions of the muscles of this *skeletal* system produce all those movements of the limbs, trunk, head, and organs of speech by means of which relations with the outer world are maintained. In man these movements are under the control of the will. The muscles of the other systems are embedded in the viscera, or internal organs of the body, and cannot for the most part be controlled by the will. The corresponding sense-organs of the *visceral* system are also embedded in the viscera and are stimulated by movements, changes of pressure, and chemical changes occurring in their neighbourhood. The nervous impulse caused by the stimulation of one of these sense-organs traverses a sensory neurone of the visceral system, crosses one or more synapses, and finally travels back by a motor neurone of the same system until it reaches the visceral muscle, the consequent movement of which adjusts the viscus to meet the changes which gave rise to the nervous impulse. In this way are brought about the involuntary movements of the heart, stomach, and other viscera.

The two systems of sensori-motor arcs, the skeletal or voluntary and the visceral or involuntary, are intimately connected. The skeletal muscles are controlled not only by impulses from sense-organs on the surface of the body, but also by impulses initiated in sense-organs that are embedded in the

¹ The terms 'afferent' and 'sensory' are not always equivalent. 'So many of the duties exercised by afferent impulses are concerned with control and guidance of motion or other acts, which are performed outside consciousness, that the essentially psychological nature of sensation is neglected or forgotten.' (Head, *Aphasia*, Vol. I, p. 479. See below, p. 40.)

muscles themselves and in the surrounding tissues, the sheaths of the muscles and their tendons and the joint-surfaces of the bones; these sense-organs, which are known as the organs of the 'muscular [or kinaesthetic] sense', are stimulated by the contractions of the muscles and the movements of the parts resulting from those contractions. The nerves from these sense-organs join the sensori-motor arcs that connect the skeletal muscles with the sense-organs of the surface, and so co-operate with them in determining the sequence and the force of the contractions of these muscles, which are thus under a double sensory control as well as the control of the will. These are the functional units which with their complicated inter-connexions constitute the nervous system. They are represented schematically in the diagram.¹

The afferent nerves of the skeletal system, including those of the kinaesthetic sense as well as those conveying impulses from the sense-organs of the body's surface, communicate with the motor or efferent nerves of the skeletal system only in the spinal cord and in the brain. Many of the afferent neurones, after entering a segment of the cord and giving off collaterals, are continued up the cord and give off further collaterals in various segments. These collaterals may link up, in the same segment, with motor nerves leaving the cord from that segment (and providing the paths used in spinal reflex movements²). But the afferent neurones in the

¹ The two preceding paragraphs summarise McDougall's description (*loc. cit.* pp. 16, 17). The diagram (Fig. 1) is reproduced with modifications from p. 17 of McDougall's work.

² Sometimes the impulse arising from a stimulus applied to a sense-organ of the surface of the body or of the muscular sense will, on reaching the spinal cord, give rise to an impulse in the efferent motor neurone alone. No impulse will then travel up the spinal cord. In such cases the resulting movement is described as a spinal reflex movement. In the case of dogs and other animals it is possible to sever all the afferent and efferent paths that connect the brain with the remainder of the central nervous system, and yet to obtain these spinal reflex movements. Examples are quoted from Sir Charles Sherrington on p. 44.

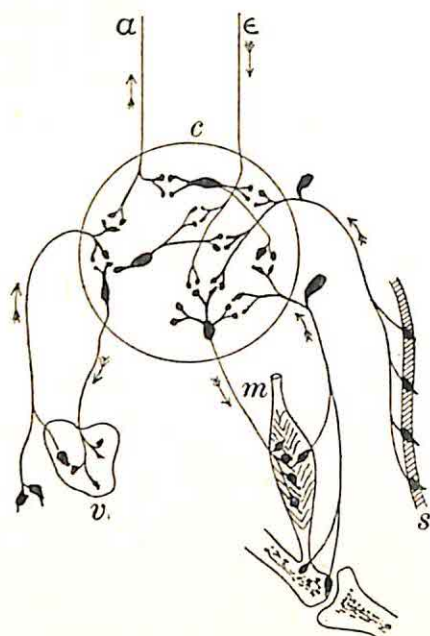


FIG. 1. Diagram illustrating the functional units, the skeletal and visceral sensori-motor arcs of each segment of the nervous system of a vertebrate animal: *c*, the central nervous system; *m*, a skeletal muscle attached to the bone; *s*, the skin covering it; *v*, a muscular viscus. On the right is shown a skeletal arc with double afferent path from sense-organs of the skin and from sense-organs of the 'muscular sense' in tendon, joint-surface, and muscle; on the left an arc of the visceral system with afferent path from sense-organs in and about the viscus.

[Descending (efferent) fibres, ϵ , connect the brain through synapses in the spinal cord, *c*, with the other neurones represented in the diagram and enable skeletal movements to be produced not only reflexly from below, but also voluntarily from above. Ascending (afferent) fibres, *a*, also connecting with the other neurones through synapses in the spinal cord, *c*, enable consciousness to be affected by skeletal movements whether of voluntary or reflex origin. There are also other ascending (afferent) fibres linking the brain with sense-organs in various parts of the body and especially upon its surface. The long neurones, ϵ and *a*, running lengthwise in the spinal cord, are not represented in McDougall's original diagram.]

cord communicate, in the upper part of it, with other long neurones. These prolong the afferent or sensory path until it reaches the cerebrum¹ or great brain on the side of the body opposite to that in which the impulse originated by the stimulation of a sense-organ. The sense-organs of all parts of one side of the body are thus connected with the so-called 'sensory areas' of the cerebrum on the opposite side.²

Not until it reaches the brain does a nervous impulse originating in a physical stimulus to a sense-organ give rise to sensation. But when nervous impulses traverse certain regions of the brain, consciousness is apt to be affected. These regions include the thalami³ and the sensory areas of the cortex or outer layer of the cerebrum. If part of one of these sensory areas is damaged or removed, then the corresponding sensations—visual, auditory, olfactory, or the like—can

¹ It used to be supposed that every sensation was accompanied by activity in certain sensory regions of the cortex, or outer layer of the cerebrum. But the researches of Sir Henry Head and Dr Gordon Holmes, beginning with those described in the Croonian Lectures of 1911 (see *Brain*, Vol. xxxiv (Nov. 1911), pp. 102 *et seq.*), showed that two bodies known as the optic thalami and situated one on either side of the base of the cerebrum are not merely intermediate receiving stations or junctions between successive neurones in sensory paths from the surface of the body to the cortex of the cerebrum, but are themselves the seats of certain primitive elements in sensation. 'Thus, reactions of the human optic thalamus, freed from the restricting influence of the cortex, are an almost perfect expression of the non-discriminative aspects of sensation.' (Henry Head, on 'Sensation and the Cerebral Cortex', *Brain*, Vol. xli (Sept. 1918), p. 200.) In particular those components of sensation which underlie feeling-tone tend to excite thalamic but not cortical centres. (See Head and Holmes, *Brain*, Vol. xxxiv, p. 190.)

² This is not strictly true of the eyes, where there is partial crossing only. For particulars of the bilateral representation of each retina in the brain, see any treatise on Physiology or Anatomy. Cf. the diagram given by Dr Purves Stewart in *The Diagnosis of Nervous Diseases*, 4th edition, p. 46.

³ See footnote 1 above.

neither be experienced nor imagined.¹ And the converse fact, that sensations or images in the mind are accompanied by nervous impulses in the sensory areas of the brain, is indicated by Pavlov's and Hudgins' experiments described below. The 'electro-encephalograph' has recently supplied direct evidence of electrical disturbances, and therefore presumably of nervous impulses, in the visual area of the cortex when light enters the eye.²

Sensations do not, however, always result from a physical stimulus acting on the peripheral nervous system even though the stimulus may be adequate in quantity and quality to produce sensation under more favourable conditions. Indeed, as we have just seen, 'many afferent impulses remain on the physiological level and never form the basis of a sensation; they are destined to control reflex activity or to co-ordinate movements of the body and limbs'.³

When the fibres which continue the various sensory paths to the cerebrum come to an end in the layer of grey matter constituting the cortex, we can no longer trace their connexions anatomically in the dense tangle of neurones which

¹ Cf. McDougall: 'So long as any sensory area is intact the corresponding qualities of sensation may be experienced, and even though the sense-organ be destroyed or the sensory nerves severed the sensations may still be experienced in the form of hallucinations; and, on the other hand, if one of the sensory areas is destroyed by disease or a wound, the corresponding sensations are never experienced again though the sense-organ and the sensory nerves remain intact, and their disappearance from the consciousness of the individual is so complete that he is not even aware of the nature of his loss, it is with him as though he had never experienced this kind of sensation.' (*Loc. cit.* p. 55.)

² In this experiment the changes of potential differences between two electrodes (touching the back of the head close to the visual area in the occipital pole of the cortex) deflect the moving light spot of an oscillograph.

³ Henry Head, *Brain*, Vol. XLI (1918), p. 201.

are the principal constituents of this grey matter. Anatomy does, however, provide us with a good deal of information, about this grey matter, and we can gather much more by other means, notably those of clinical medicine.

We know, for example, that from the sensory areas of the cortex fibres pass down to join the various motor neurones which convey the nervous impulses to the skeletal or 'voluntary' muscles.

In the kinaesthetic or 'Rolandic' area of the cortex are the cell-bodies of large neurones, known from their shape as the 'pyramidal' cells. Their axons, forming the 'pyramidal tract', pass down to connect directly with the motor neurones. The cell-bodies of these neurones lie in the various segments of the spinal cord, and their axons thence conduct impulses to the skeletal muscles of the trunk and limbs. From physiological data we can conclude that the afferent neurones which enter each of the sensory areas are connected by shorter or longer chains of small neurones in the grey matter of the area with the efferent neurones of the same area. We are able to infer also that, in the main, the afferent neurones of any one sensory field or region of the body are most intimately connected, in the sensory areas of the cortex, with the efferent neurones that make connexions with the motor systems of the same region. These are the motor systems that have the most intimate functional relations to that sensory field. Similar connexions between the afferent neurones of any one sensory field and the motor neurones of that field are made, as we have seen, in that segment of the spinal cord to which enter and from which emerge the sensory and motor nerves of the field in question. But we may assume that the connexions effected by means of loop lines are far more complex than those of the spinal level and so render possible a far more complicated series of co-ordinated movements. McDougall calls these loop lines 'arcs of the intermediate level'. They connect, through a sensory area of the cerebrum,

the sensory and motor neurones of the same field, neurones that are already connected in the corresponding segment of the spinal cord.¹

A still higher degree of co-ordination, adapted to still more complex situations, is effected by means of the neurones of the large cerebral 'association areas' which surround various sensory areas of the cerebrum and connect them with one another.

Series of these neurones form arcs among which we may distinguish two principal kinds.

In the first place there are those which connect the sensori-motor arcs of the Rolandic or kinaesthetic area with sensori-motor arcs in the other sensory areas of the cortex. They converge upon the Rolandic area from all the other sensory areas, and the impulses that they bring find, in the large pyramidal neurones already mentioned, their efferent paths to the motor neurones of the skeletal muscles. Hence this system of pyramidal neurones with the cortical paths converging upon it from all parts of the cortex has been aptly likened by William James to a funnel,² the mouth and conical body of the funnel being represented by the converging cortical paths, its neck by the Rolandic cortex, and its stem, through which the outflow takes place, by the pyramidal tract.

A second important class of association-area or 'higher level' arcs consists of arcs connecting the various sensory areas, other than the kinaesthetic area, of each of the two hemispheres, formed, one on the right side and one on the left, by the cortex and adjoining parts of the cerebrum. Moreover, transversely running fibres connect each part of one hemisphere with the corresponding part, as well as with other parts, of the other hemisphere.

¹ This account of the sensori-motor arcs of the intermediate level is abridged from that given by McDougall, *loc. cit.* pp. 43-5.

² *Principles of Psychology*, Vol. II, p. 581.

The superior function of the arcs of these association-areas is indicated by the fact, clearly demonstrated by Professor Flechsig, that their neurones attain structural perfection in each individual at a much later age than those of other parts of the nervous system. While the latter are fully developed at birth, most of the former are not perfected until long afterwards, some not until adult life is reached.¹

A clearer idea of the functions of the nervous arcs of the different levels—spinal, intermediate and higher—may be obtained by considering a simple case of the passage of excitement from its origin in a sense-organ to its discharge in producing movement. Suppose that I am walking barefoot by the sea shore. I am, at the same time, talking with a friend. Not noticing where I tread, I step—with my right foot, let us say—on a sharp pebble. Immediately and involuntarily my right knee and hip joints are bent so as to lift the injured foot. At the same time my left leg is more rigidly extended to take the extra weight thrown upon it.

If the hurt is slight, and if my conversation is sufficiently engrossing, this co-ordinated series of movements may take place without attracting my attention and without the intervention of my will. The impulses, which the sharp stone started in the sensory nerve endings in the sole of my right foot, travel up the sensory neurones at the speed of an express train. Where these neurones enter a segment² of the spinal cord in the lumbar region they give off collaterals or branches. These connect, through small neurones in the grey matter of the segment, with motor neurones leading to the muscles

¹ This account of the higher level arcs is slightly abridged from that given by McDougall, *loc. cit.* pp. 90, 91.

² This segment is represented schematically by the circle in the diagram on p. 38.

of both legs. Part of the excitement probably leaves the sensory neurones by way of those collaterals; and, after crossing the synapse or synapses in the grey matter of the segment, passes on, by way of motor neurones whose roots lie in the same segment, to the flexor muscles of the right leg and the extensor muscles of the left.

On reaching the muscles, the nervous impulses give rise to chemical changes which result in the contraction of the muscles and the motion of the limbs. These movements stimulate kinaesthetic sense-organs which send back impulses to the same segment of the cord. Part of this excitement then spreads from the cord along the motor neurones, and so serves to maintain and regulate the contractions of the muscles concerned.

Experiments made by Sir Charles Sherrington upon 'spinal' dogs—dogs whose spinal cords had been severed just below their brains—prove that in these 'spinal' animals the stimulation of sense-organs on the sole of one hind foot will result in the withdrawal¹ of that foot and the extension² of the other hind leg. In such a case impulses cannot traverse the higher portion of the afferent paths which lead to the brain. We then have an example of a simple spinal reflex in which the brain takes no part. And more complicated spinal reflexes, involving several segments of the cord, may also occur in spinal animals. If a chemical irritant be applied to the flank of such an animal, the hind foot of the same side will make scratching movements³ which are almost as well aimed as if the animal were entire; and, if that foot be held, then the other hind leg will make similar movements.

¹ *The Integrative Action of the Nervous System*, p. 10.

² *Loc. cit.* p. 30.

³ Sherrington, *loc. cit.* p. 10.

But it is probable that in man even so simple an automatic movement as the withdrawal of one leg and the extension of the other cannot take place without affecting the 'fringe of consciousness', the vague background of thought. We must therefore suppose that, in the case we have imagined, while part of the excitement from the sole of my right foot (and from the kinaesthetic sense-organs so soon as they have been stimulated by the beginning of movement) goes through a short circuit wholly on the spinal level, another part pursues afferent paths as far as the cortex of the cerebrum. Thence it returns, by the neurones of the pyramidal tract, to be discharged along the motor neurones that produce the movements we have described. It thus traverses a long loop through sensory regions of the brain—in the thalamus as well as in the cortex—where it may, as we have seen, make me conscious of pain in my foot and of the movements of my limbs. In fact the spinal reflex of the spinal dog becomes, in man, a 'sensation reflex' affecting consciousness and under voluntary control.

Now suppose that the injury to my foot was somewhat sharper than before. Unless my attention was very much occupied, I may have become conscious not only (as in the case already considered) of the hurt and of the quick withdrawal of my foot but also of having involuntarily stooped down and clasped the sore toe with both hands so as to ease the pain. The excitement conveyed by the sensory neurones to the spinal cord will now be more intense than before. The intensity is not only above the thresholds of the synapses lying along the low-resistance path to the muscles which produce the reflex already described. It is also sufficient to pass the synapses—in the cord or in arcs of the intermediate

level¹—connecting the afferent path from the sole of the foot and from the kinaesthetic sense-organs, stimulated by the usual reflex, with efferent paths to muscles of the trunk, arms and hands. Excitement from the kinaesthetic sense-organs in these moving parts reinforces, as before, the motor impulses that began the movements. It also, on reaching the brain, makes me conscious of these movements. The conception of series of neurones congenitally linked together by synapses with thresholds not too high to form 'functional systems of nervous arcs' is of great importance in our subject.

Once more, suppose that, instead of merely causing me a moment's pain and giving rise to a series of involuntary if quite conscious movements, the injury to my foot is serious enough to require treatment. This time I do not let go of my foot, put it to the ground, and resume my walk and talk as if nothing had happened. The wound now receives my full attention. I turn the foot over with the help of my hands in order to see what harm has been done, I examine it carefully, and perhaps I tie it up so as to keep it clean until I reach home. My action is no longer a mere sensation-reflex, as when the excitement was confined to arcs of the intermediate level. This time, the excitement arriving from the sense-organs of the surface and from those of the kinaesthetic sense is strong enough to pass the synapses in certain higher level arcs.¹ So it spreads to other sensory areas of the cortex. Suppose it spreads to the visual area. Then, just as I previously experienced tactile and kinaesthetic sensations when the corresponding sensory areas were excited, I now experience a 'visual image' of my foot: I see my foot in imagination.

¹ See above, p. 42.

This visual image differs from a visual sensation. Psychologically, it appears less vivid, less intense. Physiologically, the difference probably is that, in the case of the sensation, the nervous impulse enters the visual area of the cortex by way of the afferent path from the sense-organs of the retina, while, in the case of the image, the higher level path conveys the excitement to the same system of arcs in the visual area.¹

From the system of arcs where it gave rise to a visual image of my foot, the excitement makes its way wherever the synaptic thresholds are not too high. Some of these open paths lie in the visual area. As it spreads along these, it may give rise to a train of visual imagery. The conditions under which such thinking takes place we are to study shortly. Meanwhile we may take it that, in the case now before us, the excitement leaves the visual cortex by a system of arcs of low resistance and leads to the focusing of my eyes upon the 'imagined' object, the injured part of the foot. As the sense-organs of the retina are now stimulated by light from the foot, excitement from the retina reaches the visual area and the visual image gives place to a visual sensation of the foot and its injury. Now that visual sensations have been added to tactile, the injury may be said to be 'perceived'; for 'perception seems to involve in every case a synthesis of sensations and images of different senses'.²

From now on the process, which up to this point may have remained involuntary, is almost sure to be controlled by my will. The questions how the will's control is exercised, and

¹ Cf. McDougall, *loc. cit.* p. 85.

² McDougall, *loc. cit.* p. 94. It should be added, however, that McDougall's use of the word 'perception' is not universally followed.

what is the physiological accompaniment of the exercise of the will, are to be discussed later. Suffice it here to say that I concentrate my attention upon the wound, perhaps contracting muscles in my eyes so as to improve their focus. These contractions stimulate sensory nerve endings from which further impulses pass and increase the excitement already in the cortex. The result is that it can now spread through synapses with still higher thresholds. It may, for example, spread to other areas of the cortex and awaken images (memories) of lectures on first aid or of advice given to me on some previous occasion. If that advice was to tie up the wound until it could be properly cleansed, the memory of the advice remains in the form of a system of nervous arcs with thresholds permanently lowered, at least so long as the memory survives. Along such a path the excitement passes to the Rolandic area and so down the pyramidal tract as I begin tying up the wound.

All these sensations and images, here much over-simplified, are not in the focus of consciousness at the same moment. They follow one another in an orderly sequence. And, as we shall soon see, there is reason to suppose that systems of arcs in the sensory areas of the brain are meanwhile being excited, one after the other. The excitement of each in turn corresponds to each successive state of consciousness.

In this illustration of the working of the nervous system we have assumed that the impulses pass along the nerve-fibres and their branches within the spinal cord and the brain in the same way as along the nerves of the arms or legs. There is no reason to doubt the validity of this assumption although the experiments of Keith Lucas and his successors

upon the passage of nervous impulses were confined to the peripheral nerves.¹

We have also assumed that, except in one important respect, each of the series of synapses in a nervous arc of the intermediate or higher level behaves like those of the spinal level in the experiments of Sherrington and his school.² In particular, we have supposed that every synapse has its threshold, lower or higher. Unless the excitement arriving by the 'pre-synaptic' neurone overtops this threshold, the 'post-synaptic' neurone will receive no stimulus whatever: the excitement must exceed the threshold value or it will not cross the synapse. And excitement will traverse a nervous arc or a system of arcs only if its initial intensity exceeds what we may call the threshold of the arc or of the system as a whole;³ but, as stated on p. 35 above, this threshold depends upon the general health of the body at the time.

It is true that no direct experiments have yet been made upon the working of cortical synapses. But '*there is every reason to believe that intrinsically there is no essential difference*

¹ Cf. Creed and others: 'Although there is no accurate knowledge of the conduction of nerve-impulses along nerve-fibres and their collaterals within the spinal cord, there is no reason to suppose that it differs fundamentally from the process in peripheral nerves. Histology shows that the part of the fibre essential for conduction (axis cylinder) has a similar structure in the peripheral and central nervous systems.' (*Loc. cit.* p. 5.)

² This work is mentioned above on p. 44. It is described in Sherrington (*loc. cit.*) and in Creed and others (*loc. cit.*).

³ Cf. Sherrington: 'The threshold for any whole arc cannot be lower than the highest individual threshold in it.' (*Loc. cit.* p. 156.) Cf. also T. Brailsford Robertson: 'There is either in the central nervous system or in the peripheral neuro-muscular system, a resistance analogous to friction, requiring a definite force to overcome it and permit a reaction, just as a heavy body, resting upon a rough inclined plane, does not begin to move until the inclination of the plane attains a certain value.' (*Folia Neuro-Biologica*, Bd. VI, Nos. 7, 8, Sept.-Oct. 1912.)

between physiological dispositions and activities of the lower nervous centres (subcortical ganglia and spinal cord), which condition and determine unconscious behaviour, and those dispositions and activities of the higher centres... which condition and determine both conscious and unconscious behaviour'.¹ We know from experiments upon the synapses of the cord that 'a feeble stimulus may be just strong enough to excite the sensory neurone, but the excitation may fail to overcome the resistance of the synapse and to spread to the motor neurone and muscle'; and that 'the impulse is delayed at the synapse, a certain time is required for overcoming its resistance, and the delay is briefer... the more intense is the stimulus'.² It is

¹ Morton Prince, *The Unconscious*, p. 230. Cf. also Head: 'As we ascend further step by step in the nervous system, each specific nodal point of vital activity is associated with some more highly developed psychical aptitude and the mental functions increase in complexity with each rise in physiological level. But, so long as we confine our attention to those specific aspects of psychical defect, which follow lesions of the higher anatomical centres [i.e. injuries to the cortex and sub-cortical structures of the brain], we find no function that cannot be discovered in primitive form amongst the reactions of the isolated nervous system', e.g. in Sherrington's spinal dogs: see above, p. 44. (*Aphasia*, Vol. I, p. 496.)

² McDougall, *loc. cit.* p. 31, who cites the following further facts which reveal 'the resistance presented by the synapse to the passage of the "impulse";... (4) the application of a continued stimulus, such as a chemical irritant, to the sensory neurone results in a rapid succession of impulses in the motor nerve; the energy continuously liberated in the sensory neurone seems to be discharged across the synapse intermittently, just as the electrical energy generated by the friction of an electrical machine is discharged intermittently from pole to pole of the machine, causing a rapid series of sparks; (5) the transmission of the impulse in the reverse of the normal or habitual direction, i.e., in the direction from motor to sensory neurone, seems to be very difficult or impossible... Other characters of the synapses may be inferred from more general considerations: (6) the process of transmission of energy across the synapses is one that readily exhibits fatigue from which recovery is very rapid; the fatigue manifests itself as a temporary increase of resistance;...

clear, therefore, that the principal cause of the resistance offered by sensori-motor arcs of the spinal level is to be found in the synapse or synapses they include. Accordingly, it is reasonable to assume¹ that the resistance offered to the passage of nervous impulses along cortical systems of arcs is also due to the synapses between consecutive neurones. And we know by introspection that, just as the more we practise doing something in a certain way the more we tend always to perform it in precisely that way, so the repeated passage of a sequence of images through our consciousness makes the sequence tend to recur in the same order. It is, therefore, probable that the passage of excitement across any synapse, whether subcortical or cortical, leaves the threshold of that synapse permanently lowered in some degree; and that, the more often the excitement crosses the synapse, the lower

(7) the synapse is readily affected by changes in the composition of the blood, especially by the presence in it of certain drugs and of waste products of nervous and muscular activity which cause an increase of its resistance; (8) the resistance of the synapse, besides being liable to be increased by fatigue and changes in the composition of the blood, varies from moment to moment with the state of the neurones between which it forms a junction, being diminished when they are excited and charged with free energy, increasing again when they return to rest; (9) the process of transmission of energy across the synapse leaves its resistance to the passage of the impulse. . . permanently lowered in some degree.'

¹ The assumption that the resistance offered to the passage of excitement through nervous arcs is due to the synapses in those arcs is not essential to our argument. All that is necessary is to assume that *in some way* the passage of excitement along a nervous arc makes it easier for it to pass the same way again. We know this assumption to be justified in the case of every arc on which the experiment has been made. But if, following McDougall, we make the first assumption in the text, that the resistance is (mainly) due to the synapses, then we must also follow him in making the second, that the threshold of the synapses is lowered whenever excitement succeeds in crossing them, at least in the case of arcs belonging to the intermediate or higher levels. All the available evidence supports both these assumptions.

does the threshold become. It is true that no such lowering of the threshold has been measured in experiments upon spinal reflexes.¹ We should not, however, expect that a neural mechanism essential to learning by experience would show itself (except, perhaps, in an infinitesimal degree) in the basic reflexes of brainless animals. For the rest, our assumption is consistent with all the known facts and is inconsistent with none. Moreover, it enables us to resume and predict many experimental results. It satisfies, therefore, the only conditions required of a 'scientific law'², which we said was a hypothesis consistent with experience. We shall, therefore make this provisional assumption. It will enable us to explain not only the formation of neural habits but also the association of ideas and even memory itself. For the physiological basis of all these consists in systems of nervous arcs of low resistance: arcs, that is, with thresholds of various degrees of lowness.³

¹ But Head writes: 'The central nervous system does not function on the principle of an automatic machine, where a coin thrust into one slot produces chocolates, into another a box of matches or some other article. What we obtain, when we throw a stimulus into some part of the central nervous system, depends to a great extent on what has happened before.' (*Aphasia*, Vol. 1, p. 492.)

² See above, footnote 1 on p. 15.

³ Sherrington uses 'threshold heights' and 'resistances' as synonyms. (*Loc. cit.* p. 155.)

CHAPTER 4

NEUROGRAMS

§1. NEUROGRAMS OR NEURAL DISPOSITIONS

WHEN describing reflex movements we said we should have much to do with systems of neurones congenitally linked together by synapses with low thresholds. Arcs and systems of arcs with thresholds lowered by the passage of excitement will be hardly less important in our discussion. The word neurogram has been suggested by Morton Prince¹ to describe brain records of thoughts and other mental experience. We shall use this word, rather than the more usual term 'dispositions', to describe all low-resistance paths, whether among the neurones of the brain or among those of other parts of the nervous system, and including congenital paths of low resistance as well as those worn by the experiences of life, or rather by the passage of the excitement caused by these experiences.²

¹ 'Just as telegram, Marconigram, and phonogram precisely characterise the form in which the physical phenomena which correspond to our (verbally or scripturally expressed) thoughts, are recorded and conserved, so neurogram precisely characterises my conception of the form in which a system of brain processes corresponding to thoughts and other mental experiences is recorded and conserved.' (*The Unconscious*, p. 131.) Neurograms are sometimes called 'engrams'.

² Prince uses the word 'neurogram' for acquired neural dispositions only. But we shall find it more convenient to use the same word to describe similar low-resistance systems of arcs whether congenital or acquired. Both instinctive behaviour and acquired behaviour 'must be conditioned by pathways, and the process in its inner nature must be the same in both.' (Prince, *loc. cit.* p. 237.)

Our reasons for avoiding, wherever possible, the use of the word 'disposition' in this sense are, firstly, its very different connotation in popular speech, and, secondly, its use in psychological writings to describe what is psychical, as when McDougall speaks of the mind and its dispositions where we prefer¹ to speak of the brain and its neurograms.

Examples of neural dispositions, or neurograms, are the functional systems of nervous arcs excited in any case of reflex action. To every simple spinal or sensation reflex there corresponds a neurogram which is excited during the reflex act. To every habit there also corresponds a neurogram, or a 'system of neurograms' as we may more conveniently say when the habit involves a sequence of movements and we want to consider them separately. But we must be careful to distinguish the habit itself, a man's permanent possession, from the occasional movements to which his habit may give rise. His neurogram is permanent—or 'canalised'²—and corresponds to his habit, while the occasional excitement of his neurogram accompanies his movements when they occur. The same neurones and systems of neurones may form part of several different neurograms, just as the same movement may take place in several different reflex or habitual acts: some of the movements of 'dropping a goal', almost a habit with some people, are the same as those of the reflex that results from stepping barefoot on a hot brick.

¹ See above, pp. 15–19. McDougall writes: 'Without identifying a system of mental dispositions with a system of nervous arcs in the brain, we may yet assume that to every system of mental dispositions there corresponds a neural system in the brain', i.e. a neurogram. (*Outline of Psychology*, 1923, p. 280.)

² See below, p. 124.

We have seen¹ how reflex acts depend upon congenital neurograms of the spinal and intermediate levels. Swimming, skating and bicycle riding are further examples of habitual movements that go with the excitement of acquired neurograms. When learning to swim, to skate or to ride a bicycle we pay attention to what we are doing. We control our movements so far as we can. But when we are able to swim, or skate or ride a bicycle, the movements take place involuntarily and even automatically, perhaps without our being conscious of them. We may not be able to tell how we use our muscles to turn a corner on a bicycle. Indeed we cannot hope to bring back to conscious memory images of movements of which we were unconscious when they happened. Somewhere, however, the record of the movements must be preserved so that they may be reproduced from time to time as occasion demands. And in the conception of a system of neurograms, created as the paths of low resistance² were worn, under voluntary control to start with and afterwards by slight involuntary improvements in the movements we first learnt, we have a simple explanation of the facts of 'unconscious memory'.³

But it is not only of unconscious movements that a record is preserved in the form of neurograms tending to make a nervous process repeat itself. We have already seen that every state of consciousness is accompanied by nervous impulses

¹ See above, pp. 44, 45.

² I.e. low threshold paths. See above, p. 52.

³ The phrase is used by Morton Prince, who adds: 'By repeated experience the neurones become functionally organised in such a way as to acquire and conserve a functional "disposition" to reproduce the movements originally initiated by volition.' (*Loc. cit.* p. 137.)

in one or more sensory regions of the brain.¹ In fact 'it is universally accepted that every mental process is accompanied by a physical process in the brain; that, parallel with every series of thoughts, perceptions, or feelings, there goes a series of physical changes of some kind in the brain neurones. And, conversely, whenever this same series of physical changes occurs the corresponding series of mental processes, that is, of states of consciousness, arises'.² And it is reasonable to suppose that, to different mental processes, there correspond physical processes in different systems of nervous arcs.³ So we may take it that the brain process, which corresponds to a particular sensation (or image) and which, we know, involves nervous arcs in certain sensory areas of the brain, consists in the excitement of a particular series of brain neurones. That series corresponds to that sensation (or image) and to it alone.

When the threshold of a neurogram is lowered, it will be excited by a smaller stimulus than before. We prefer to speak shortly of the 'depth' of a neurogram than of the degree of lowness of its threshold. Now consider the neurogram that is excited when some particular sensation (or image) comes before the mind. Its depth depends on two things: on the intensity of the excitement on each previous occasion when the same thing happened, and on the number of these occasions. The depth of neurograms, therefore, varies between wide limits. Some will be so shallow as barely to deserve recognition as neurograms at all. The level of the

¹ See above, pp. 39, 40.

² Morton Prince, *loc. cit.* p. 118.

³ But not necessarily, of course, in wholly different sets of neurones: see above, p. 54.

synaptic thresholds will also vary from one part of a neurogram to another, as when we remember the colour of an object quite clearly but have difficulty in recalling its shape.

Introspection tells us that, if two sensations or their images are presented to consciousness in quick succession, they are apt to recur in the same order in future. The first sensation (or image) tends to recall the second. As it is usually expressed, they become 'associated' in the mind. What does this association imply in physiological terms? The necessary and sufficient condition of association must be such that, when the neurogram of the object of the first sensation (or image) is excited, the excitement shall tend to spread to the second neurogram. This condition is that the two should be linked together by a low threshold path, thus forming a 'system' of two neurograms.

How is this linking brought about? At one moment neurogram *A* is excited; at the next, neurogram *B*; thereafter *A* and *B* are joined together by a low threshold path. Such a path would be made if excitement spread from *A* to *B*; and we know of no other way to account for this new path. So it seems that, when the second sensation (or image) is strong enough to attract attention from the first, and when therefore the second neurogram, *B*, is sufficiently excited in comparison with the other, *A*, excitement will pass from *A* to *B* and add to the stream of impulses in the latter neurogram. We may then speak of *B* attracting excitement from *A*.

Most of the neurograms discussed above are made up of arcs belonging to the intermediate and spinal levels. Their excitement goes with simple sensations or images or reflex

acts. The time has come to consider neurograms beyond these limits. They will include arcs of the higher level.

When we think of a familiar object—any one will do: suppose it is 'Whitehall'—the idea in our minds is more than a simple sensation or image. Unless we have never seen or heard of Whitehall before, the visual sensation of reading the word is followed by the 'meaning' that it has for us. The idea of Whitehall in the mind of a particular individual at a given moment includes both a sensation (or image)—in this case, the name 'Whitehall'—and the meaning it has for him just then. If he has the mind of a child, the meaning may consist of no more than visual images of the mounted sentries at the Horse Guards or of crowds round the Cenotaph, and auditory images of the roar of traffic or of the sound of bugles. If he knows some history, the meaning may include images of Charles I and a snowy morning at the end of January, 1649, as well as more abstract thoughts about constitutional history. If he is a manufacturer of armaments, the master of a workhouse, the governor of a prison, a director of education, or a company promoter, the meaning of Whitehall will probably centre round the Admiralty or the War Office, the Ministry of Health, the Home Office, the Board of Education, or the Board of Trade as the case may be. And if his experience of Government Offices has been unlucky, or if he is a rabid individualist, the meaning may include an auditory image of the words 'red tape' and, possibly, a regretful vision of the Civil Service in the days of the first Henry, when it consisted of no more than two or three persons who, with a pack-horse to carry the official records, accompanied the monarch on his journeys up and down the country.

For each of these different people the word 'Whitehall' has a different meaning.¹ It even has a different meaning for the same person at different times. To me, now, the word means no more and no less than my whole thought about Whitehall at this instant of time. That thought depends, we said, upon the distribution of excitement in a group of neurograms linked together by low-resistance paths. One of these is excited when the word 'Whitehall' is read, another when it is heard; and the low-resistance path between them includes higher level arcs in one or more of the association areas of the brain. If now we choose to regard as a single neurogram the whole group that may be excited when an idea of Whitehall fills my mind, that single neurogram is plainly one that includes arcs of the higher level. To the one and only Whitehall there corresponds in my mind this one neurogram and only this one. True, Whitehall may slowly alter, as it does every time a new Government Office is built; and my neurogram of it gradually changes also, as I come to know more about it, or to feel differently towards it. But, here and now, while I may have all sorts of ideas about Whitehall, I have one and only one neurogram of it; and that neurogram represents for the time being all that Whitehall means to me. So, for every object I can think of, I have

¹ 'What for one perceiver is only a little cloud becomes for another the harbinger of a dangerous storm. What to one is but an awareness of a "horse" presents itself to another as that of a "clumsy-shouldered, slack-loined, curby-hocked, aged gelding". What for one is no more than a "Kodak" develops for the perception of another into a "reflex, extension, swing-front, focal-plane, anastigmatic, hand-camera de luxe". In attaching such additional cognitive items, which gradually overtake and finally coalesce with the pure percepts, lies one of the largest endeavours of pedagogy. By industrious learning, the sight of dew becomes enriched into that of condensed aqueous vapour.' (Spearman, *The Nature of Intelligence*, 1927, p. 257.)

one, and only one, neurogram. It is my neurogram of the object, and it is as much a real physical thing as the object itself.¹ Indeed, my neurogram might be more real than its object: for example, if this were the square root of minus one.

Take another example. When I think of so-and-so, I may have in my mind no more than a visual image of his face or an auditory image of his nick-name. But my neurogram of him includes not only the arcs which are excited when these images pass through my mind but many more also. Among them are whatever arcs may be excited when I think of his character, his appearance, the sound of his voice, anything that I have heard or read about him, or anything that is his; or when any emotion colours my thought of him. Every time I think of so-and-so the excitement traversing this large neurogram reaches a maximum in a different part of it. The state of my consciousness consequently differs also, images corresponding to the most excited sensory arcs of the neurogram being in the focus² of my consciousness and images corresponding to those less excited being more or less on the fringe. As William James has it, 'no two "ideas" are ever exactly the same.... *A permanently existing "idea" or "Vorstellung" which makes its appearance before the footlights of consciousness at periodical intervals, is as mythological an entity as the Jack of Spades.*'³... 'What is got

¹ Cf. Hughlings Jackson, quoted by Henry Head: 'Words have of course anatomical substrata or bases as all other psychical states have.... The anatomical substratum of a word is a nervous process of a highly special movement of the articulatory series. That we may have an "idea" [or "image"] of a word it suffices that the nervous process for it energises; it is not necessary that it energises so strongly that currents reach the articulatory muscles.' (*Aphasia*, Vol. I, pp. 49, 50.)

² See below, p. 89.

³ *Principles of Psychology*, Vol. I, pp. 235, 236.

twice is the same OBJECT'¹ or, as we may now add, the same neurogram.²

A clear distinction must be made between the neurogram, a comparatively permanent feature of the nervous system, and the fleeting idea in the mind during the transitory excitement of the neurogram, a different idea every time the neurogram is differently excited. 'Nothing but . . . confusion can result from the mixture of "brain-cells" and "ideas".'³ An idea only exists when it is in the mind. Yet the word 'idea' does convey some suggestion of permanence. We can avoid this confusion by using the word 'thought'. But, having been warned, we may employ the term 'idea of an object' to describe any of the infinitely various thoughts resulting from different distributions of excitement in the neurogram of that object—or even in part of the neurogram, so long as the part is big enough to define⁴ the neurogram and, therefore, the object. A particular idea of an object thus results from a particular distribution of excitement in the neurogram of that object.

We have still to consider neurograms that include arcs of the visceral nervous system. 'A beautiful illustration'—we quote Morton Prince⁵—'. . . is to be found in the results

¹ *Loc. cit.* Vol. I, p. 231.

² Note that the neurogram corresponds, although imperfectly (see below, p. 224), to the object—actually the neurogram corresponds to the object not as thought of on any single occasion but in all the aspects in which the thinker has ever thought of it—while the excitement of the neurogram in any particular manner corresponds to a particular idea of the object. So I may speak of 'my neurogram of that object' with a more precise meaning than if I were to speak of 'my idea of that object'.

³ Bernard Hart, *The Psychology of Insanity*, p. 18.

⁴ I.e. provided that the part is not also in its entirety a part of the neurogram of another object.

⁵ *Loc. cit.* p. 139.

of the extremely important experiments, for psychology as well as physiology, of Pavlov¹ and his co-workers in the reflex stimulation of saliva in dogs....'

It should be explained [adds Morton Prince] that it was shewn that the salivary glands are selective in their reaction to stimuli in that they do not respond at all to some (pebbles, snow), but respond to others with a thin watery fluid containing mere traces of mucin or a slimy mucin-holding fluid, according as to whether the stimulating substance is one which the dog rejects, and which therefore must be washed out or diluted (sands, acids, bitter and caustic substances), or is an eatable substance and must as a food bolus be lubricated for the facilitation of its descent. Dryness of the food, too, largely determined the quantity of the saliva.

Now the experiments of the St Petersburg laboratory brought out another fact which is of particular interest for us and which is thus described by Pavlov. 'In the course of our experiments it appeared that all the phenomena of adaptation which we saw in the salivary glands under *physiological* conditions, such, for instance, as the introduction of the stimulating substances into the buccal cavity, reappeared in exactly the same manner under the influence of *psychological* conditions—that is to say, when we merely drew the animal's attention to the substances in question. Thus, when we pretended to throw pebbles into the dog's mouth, or to cast in sand, or to pour in something disagreeable, or, finally, when we offered it this or that kind of food, a secretion either immediately appeared or it did not appear, in accordance with the properties of the substance which we had previously seen to regulate the quantity and nature of the juice when *physiologically* excited to flow. If we pretended to throw in sand a watery saliva escaped from the mucous glands; if food, a slimy saliva. And if the food was dry—

¹ 'Psychische Erregung der Speicheldrüsen', J. P. Pavlov, *Ergebnisse der Physiologie* (1904), I Abteil, p. 182.

for example, dry bread—a large quantity of saliva flowed out even when it excited no special interest on the part of the dog. When, on the other hand, a moist food was presented—for example, flesh—much less saliva appeared than in the previous case however eagerly the dog may have desired the food. This latter effect is particularly obvious in the case of the parotid gland.¹

It is obvious [Prince comments] that in these experiments, when the experimenter pretended to throw various substances into the dog's mouth, the action was effective in producing the flow of saliva of specific qualities because, through repeated experiences, the pictorial images (or ideas) of the substance had become associated with the specific physiological salivary reaction, and this association had been conserved as a neurogram. Consequently the neurographic residue when stimulated each time by the pretended action of the experimenter reproduced reflexly the specific physiological reaction and, so far as the process was one of registration, conservation, and reproduction, it was an act of psycho-physiological memory.

That this is the correct interpretation of the educational mechanism is made still more evident by other results that were obtained; for it was found that the effective psychical stimulus may be part of wider experiences or a complex of ideas; everything that has been in any way psychologically associated with an object which physiologically excites the saliva reflex may also produce it; the plate which customarily contains the food, the furniture upon which it stands; the person who brings it; even the sound of the voice and the sound of the steps of this person.

Indeed, it was found that any sensory stimulus could be educated into one that would induce the flow of saliva, if the stimulus had been previously associated with food which normally excited the flow. Any ocular stimulus, any desired sound, any odor that might be selected, and the

¹ *The work of the Digestive Glands* (English translation), p. 152.

stimulation of any part of the skin, either by mechanical means or by the application of heat or cold, have in our hands never failed to stimulate the salivary glands, although they were all of them at one time supposed to be inefficient for such a purpose. This was accomplished by applying these stimuli simultaneously with the action of the salivary glands, this action having been evolved by the giving of certain kinds of food or by forcing certain substances into the dog's mouth.¹ It is obvious that reflex excitation thus having been accomplished by the education of the nerve centers to a previously indifferent stimulus the reproduction of the process through this stimulus is, in principle, an act of physiological memory.²

The experiences of the dogs embraced quite large systems of ideas and sensory stimuli which included the environment of persons and their actions, the furniture, plates, and other objects; and various ocular, auditory, and other sensory stimuli applied arbitrarily to the dogs. All these experiences had been welded into an associative system and conserved as neurograms. Consequently it was only necessary to stimulate again any element in the neurogram to reproduce the whole process, including the specific salivary reaction.³

In men as well as in dogs, neurograms (of 'conditioned reflexes') can be built up artificially so as to link together, for the time being, neurones belonging naturally to different systems.⁴ An impressive example is due to C. V. Hudgins:

He was experimenting with a subject to whom he said 'Contract', a moment later flashing a bright light into the subject's eye. As a result of the light, of course, the pupil of

¹ Huxley Lecture, *Brit. Med. Journ.* 6 October 1906.

² Prince adds the following footnote: 'Pavlov overlooked in these experiments the possible, if not probable, intermediary of the emotions in producing the effects. The principle, however, would not be affected thereby.'

³ Morton Prince, *loc. cit.* pp. 139-43.

⁴ Skeletal or visceral: see above, p. 36.

the eye contracted. He kept repeating the word 'Contract', accompanied by the flashing of the bright light, with the result that eventually what is called a conditioned reflex was set up, so that presently when he said 'Contract', but did not flash the bright light, the pupil still contracted. Then he went further, and instead of himself saying 'Contract', got the subject to say it himself, and at the end of the experiment it was found that whenever the subject said or even thought 'Contract', his pupil contracted, without the flashing of any light. Thus the subject was able to contract his pupil at will, a thing ordinarily impossible, by having built up a conditioned reflex through the motor mechanism of speech.¹

§2. PSYCHOSES AND NEUROSES

Hudgins' experiment,² like those of Pavlov, brought to light phenomena in perfect accord with our view of the nature and functions of neurograms. With Hudgins, as with Pavlov, the end of the story had nothing of mind or spirit about it. There was only a nervous impulse to the eye muscle in one case, and to the salivary gland in the other; and neither of these impulses could affect consciousness. How then were they caused? Are we to suppose that, in Hudgins' case, the sensation or the image of the spoken word 'Contract' stimulated the motor nerve and set going the impulse by some kind of psycho-physical interaction? Our own hypothesis is far simpler. It is that every thought has its counterpart in the excitement of nervous arcs within the brain; that, in this particular case, the excitement of such arcs, beginning in the auditory area of the cortex, accompanied the original thought, namely, a sensation or image of the word 'Contract'; that this excitement spread, by way of a low-resistance path,

¹ This account of Hudgins' experiment is quoted from Dr William Brown, *British Journal of Psychology* (B.J.P.), Vol. xxviii (1938), p. 406.

² Hudgins, C. V. (1933), *J. Gen. Psychol.* viii, 3-51.

to the motor nerve of the muscle which contracts the pupil; and that this path was worn by the repeated occurrence together of the signal (the word 'Contract') and of the movement (the contraction of the pupil). For the future we shall make these assumptions because they fit all the known facts, in particular those set out above on pp. 44 and 52. The gradual spread of excitement from neurogram to neurogram as we have described it is also in complete accord with William James' notion, now generally accepted, of a continuous stream of thought. We repeat that the low-resistance path pursued by the excitement is a neurogram: not an analogy or a metaphor, but a real physical thing.

§3. INSTINCTS AND EMOTIONS

The experiments of Pavlov and his disciples on the so-called 'conditioned reflexes' illustrate the working of neurograms containing visceral, as well as cerebral and spinal, arcs. But by far the most important neurograms that include visceral arcs—and in many ways the most important of all neurograms—are those of our *instincts* and *emotions*.

Some emotions are always linked up with an instinctive urge to behave in a particular way. Anger is thus linked with the impulse of aggression, fear with the impulse of escape, curiosity with the impulse to draw near and examine, and so on.¹ Each of these emotions, McDougall tells us, is

¹ McDougall's *Introduction to Social Psychology* (1908), chap. III; and *Outline of Psychology* (1923), p. 338. Professor Stout, in his *Manual of Psychology*, has followed McDougall's lead. And, according to Morton Prince (*loc. cit.* p. 446) McDougall's view is now generally accepted. Indeed Morton Prince considers that 'this formulation, by McDougall, as one factor in an instinctive process must be regarded as one of the most important contributions to our knowledge of the mechanism of emotion. It can scarcely be traversed, as it is little more than a descriptive statement of observed facts... Its value lies in replacing vagueness with a precise

either one of a group of primary emotions or else a compound of two or more of them.¹ He has extended his original list of seven primary emotions so as to include the following fourteen: Fear, anger, disgust, love or tender emotion, distress, lust (or sexual emotion), wonder or curiosity, feeling of inferiority, feeling of superiority or pride, feeling of loneliness or homesickness, appetite for food or drink, feeling of ownership or possession, feeling of creativeness, and amusement accompanying laughter.²

In addition to these primaries, alone or blended, there are certain other emotional states of mind described by McDougall as 'derived emotions'. The chief of these are joy, sorrow, chagrin, disappointment, surprise, regret, remorse, confidence, hope, anxiety, despondency, despair. None of these derived emotions is constantly associated with any one instinctive tendency. But each of them may arise when any strong impulse or tendency is at work, the emotion being dependent upon, or derived from, the working of the impulse.³

McDougall at first defined an instinct as 'an inherited or innate⁴ psycho-physical disposition which determines its conception of one of the most important of psychological phenomena, and enables us to clearly understand the part played by emotion in mental processes.' (*Loc. cit.* p. 448.)

¹ Here McDougall follows Descartes, who analysed all emotion into diversified mixtures of six only. Cf. Spearman, *Psychology Down the Ages* (1937), Vol. I, p. 331.

² Arranged to 'form a scale of diminishing degrees of "specificity"' (*Outline of Psychology*, p. 324.)

³ *Outline of Psychology*, p. 338. 'Impulse' here is not a 'nervous impulse'.

⁴ 'The statement that [neurograms] are congenitally organised does not necessarily imply that they are present fully developed at birth, but rather that they have an inherited tendency to develop along certain lines.' (McDougall, *Physiological Psychology*, p. 106.)

possessor to perceive, and to pay attention to, objects of a certain class, to experience an emotional excitement of a particular quality upon perceiving such an object, and to act in regard to it in a particular manner, or, at least, to experience an impulse to such action'. That was written in 1910.¹ Twenty-seven years later McDougall was content

to distinguish in each instinct *two* parts, a perceptual or cognitive disposition and an affective disposition which is both emotional and conative,² which on its excitement by way of the cognitive disposition determines or yields both emotional and conative effects, both the emotional quality of the experience and the felt impulse to action.³

The instincts thus linked with the primary emotions we may also call primary. When two or more of these instincts are at work together, the emotion felt is a blend of the emotions belonging to each of them.

¹ *Social Psychology*, 3rd ed., p. 29. In his *Outline of Psychology* (1923), McDougall slightly alters this definition. He writes: 'We may therefore define "an instinct" as an innate disposition which determines the organism to perceive (to pay attention to) any object of a certain class, and to experience in its presence a certain emotional excitement and an impulse to action which find expression in a specific mode of behaviour in relation to that object.' He adds that 'this formula will hold good generally, only if we take the word "object" in the very widest sense, namely, to include not only material things and organisms, but also various situations in which the creature may find itself' (*loc. cit.* p. 110); and again 'The minor instincts of scratching, sneezing, coughing, . . . are so simple in their bodily expressions that we cannot recognise as specific qualities the excitements [emotions] which accompany their exercise' (p. 325).

² 'Conative' refers to the instinctive urge or impulse to act in a particular way that is characteristic of the instinct. In the earlier definition (1910) the *three* parts of an instinct were (1) *cognitive*, (2) *emotional* and (3) *conative*. The *two* parts in the later definition are (1) *cognitive* and (2) *affective* 'which is both emotional and conative'.

³ *Acta Psychologica*, Vol. II, No. 3 (1937), p. 309. Italics mine.

To the two parts of every instinct—the cognitive, or knowing, and the affective which includes both the emotion and the impulse to action—there correspond two essential parts of the instinct's neurogram. First the cognitive part which, when excited, gives rise to the perception of the object of the instinct: for example, the thing I am afraid of or that makes me angry. This part McDougall describes as the lock fitted by the key which is the object of the instinct.¹ When the excitement spreads from the cognitive to the affective part, the emotion that belongs to the instinct is felt together with the impulse to act in some specific manner. The action itself follows. But since men do not always respond to the same impulse with the same action, we shall regard the system of arcs traversed by the excitement at this stage as a separate motor or efferent neurogram, not forming part of the neurogram of the instinct. For example, the tendency to escape under the influence of fear may lead either to movements of seeking cover or to the inhibition of all movement when cover has been found. Or the tendency to 'down' the man who angers me may lead me to injure him with my boot or my tongue instead of with my up-lifted arm.

The neurogram of an instinct is represented schematically in the following diagram. In this diagram, C represents the cognitive part, the arcs excited when the native object of the instinct is perceived or imagined. Since, however, the instinct may, in some cases at least, be stimulated directly by a sensation—fear, for example, by the scent of a dangerous beast—C may also include afferent paths from the sense-organs. The excitement spreads from the cognitive or

¹ *Outline of Psychology*, p. 106.

afferent part, *C*, to the affective part, *A*. This part includes¹ arcs in the brain itself, as well as arcs leading from the brain to the viscera and from the viscera back to the brain.² When

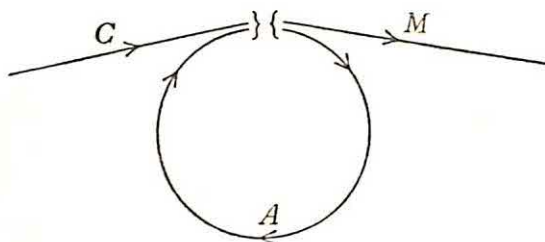


FIG. 2

this affective part, *A*, of the neurogram is excited we feel both an emotion, due to visceral disturbances,³ and an impulse (or conative tendency) to act in a specific way. The impulses

¹ 'The constitution of this part determines in the main the distribution of the nervous impulses, especially of the impulses that descend to modify the working of the visceral organs, the heart, lungs, blood vessels, glands, and so forth, in the manner required for the most effective execution of the instinctive action.' (McDougall, *Social Psychology*, p. 33.) In a footnote McDougall adds: 'It is probable that these central affective parts... have their seat in the basal ganglia of the brain.' Indeed, in his *Outline of Abnormal Psychology* (p. 228) he assumes 'as an approximation to the truth, that the instinctive dispositions, or... their emotional-conative centres, lie in the basal ganglia of the brain, more especially the thalamus'. See also above, footnote 1 on p. 39.

² In addition to the 'circular nervous process' (cf. McDougall, *Physiological Psychology*, p. 116) represented by *A* in our diagram, there is another circular nervous process (not shown in the diagram) beginning with *C*. It adds to the central excitement by bringing nervous impulses from the kinaesthetic sense-organs excited by the movements of the muscles stimulated through *C*.

³ According to McDougall our emotions are feelings mainly due to visceral disturbances. He writes, for example: 'Since the group of visceral adjustments accompanying each kind of instinctive action is peculiar to that kind, and since these adjustments cannot be voluntarily controlled or prevented, whereas the bodily instinctive movements can be, and often are, controlled and modified by the will, we rightly regard the effects of these adjustments as the most reliable symptoms of the emotions.' (*Physiological Psychology*, pp. 109, 110.)

arriving from the viscera (by arcs represented by the top left-hand part of the circle in our diagram and due to such bodily changes as are described on the next page) may vastly increase the total excitement of the brain and, eventually, the muscular contractions involved in the final act. Lastly, the separate neurogram *M*, which we do not regard as part of the instinct neurogram *CA*, represents the efferent or motor arcs whereby the excitement passes to the muscles of the skeletal system, and produces movements more or less characteristic of the instinct.

Our diagram shows the excitement of efferent arcs, *M*, reaching them by way of the cognitive or afferent arcs, *C*, as well as (in much greater quantity) from the central or affective part, *A*, of the neurogram.¹ For introspection tells us that, when three thoughts have followed each other in the same order on several occasions, the third becomes directly as well as indirectly associated with the first. The excited neurograms become connected in the same way, the third coming to be directly linked with the first. This arrangement fits William James' theory of the emotions. He holds that 'we feel sorry because we cry', instead of crying because we feel sorry as is commonly supposed. It may indeed be true that when we meet a bear we begin to run before we are frightened;² and most people will agree that, when suddenly faced with danger—of stepping over a precipice, for example—the recoil, due to the excitement of *M*, takes

¹ In this respect the scheme represented in the diagram differs from that of McDougall's *Social Psychology*: 'the excitement of the efferent or motor part reaches it by way of the central part' (p. 33 of 1912 edition). But on p. 229 of his *Outline of Abnormal Psychology* (1926) he gives a diagram showing paths by which excitement from the afferent or cortical arcs may reach the motor or efferent path.

² Cf. William James, *loc. cit.* Vol. II, p. 450.

place before the emotion of fear begins to be felt, and so before the excitement from the visceral changes reaches the brain by the last part of A.

The important part played by the emotional element in an instinctive process was first pointed out by Charles Darwin.¹ It is well illustrated in McDougall's description of the primary instinct of escape, or flight, and the linked emotion of fear:

For effective flight the muscles of the limbs need to receive the greatest possible supply of well-aerated blood; and this can only be secured by an increased force and frequency of the heartbeat, by increased frequency of the respiratory movements of the chest-walls and diaphragm, and by contractions of the small arteries of all the organs that do not immediately aid in flight, driving the blood from all these organs to the muscles of the limbs, especially from the skin and various glands which in their normal state contain large quantities of blood. Hence we find that the excitement of the instinct of flight gives rise to violent action of the heart, to hurried breathing, to pallor and coldness of the skin, to dryness of the mouth and throat, and to those disturbances of the digestive functions which result from the checking of the blood-supply to the salivary glands and other organs of digestion.²

McDougall observes that, in addition to assisting in some such manner to further the end—in this case, escape—towards which the particular instinct strives, the emotional element in every instinctive process serves the purpose of the instinct by very largely increasing the central excitement that eventually spreads down the efferent channels and so gives rise to a characteristic movement. This increase of excitement is due to impulses reaching the brain by afferent

¹ *Expression of the Emotions in Men and Animals.*

² *Physiological Psychology*, p. 110.

paths from the viscera and from the skeletal muscles. It is felt as the emotion. If the emotional excitement is too great it may overtop the thresholds of synapses in all parts of the skeletal nervous system and produce a general convulsion. But, so long as the excitement is not excessive, 'it renders instinctive action more effective, because it determines the outflow of a greater volume of nervous energy [impulses] to the muscles. Hence, under the strong excitement of an instinct, or, as we more commonly say, under the influence of strong emotion, our muscular system may execute more forcible contractions than any we can voluntarily produce in the absence of such excitement.'¹

We have so far spoken of the cognitive and affective parts of the neurogram represented in our diagram² as 'innate'. In animal life, no doubt, instincts are but little modified by life's experiences. But with men it is different. We have already remarked how neurograms that are excited at the same time tend to become permanently connected,³ and how neurograms that are linked with the same neurogram tend to become linked with one another. So both the cognitive part, *C*, of the neurogram of an instinct and the motor neurogram, *M*, may be greatly modified by experience, as may also their connexions with one another and with the affective part, *A*. But this affective part, having its excitement less under voluntary control, changes only slightly if at all.⁴

¹ *Physiological Psychology*, p. 111.

² Above, p. 70.

³ See above, p. 71.

⁴ McDougall suggests that this persistence of human emotions, and the comparative variability of human instincts, are the reasons why previous writers have not recognised the intimate connexion, which he first pointed out, between instincts and emotions. (*Physiological Psychology*, pp. 108, 109.)

Because of these modifications made by experience in the neurogram of an instinct, we may learn to respond to an object with emotions and conations other than those innately connected with objects of that class: as for instance (to quote an illustration given by McDougall¹) when a child, in whom the perception of a dog or cat or other small animal has always excited tender emotion, is once bitten and frightened by a dog and always afterwards has the emotion of fear excited by the very percepts (dogs) which previously excited tender emotion.² And we may learn to give the same emotional and conative responses to new kinds of objects as well as to those with neurograms³ already linked to the neurogram⁴ of this particular group of responses. For example, a woman in whom tender emotion is congenitally excited by the sight of small children may learn to respond with the same emotion to small objects of any other kind—lap-dogs, say, or china knick-knacks.⁵ Finally, as we saw on p. 69 above, we may learn to respond to the same cognitive and emotional experiences, if not with a different conative tendency, at least with a movement that has been modified by experience: as when a pugnacious man, who has been insulted and made angry, sends his hand flying to his sword-hilt or to his hip-pocket instead of raising it to strike.⁶

¹ 'Symposium on Instinct and Emotion', *Proc. Aristotelian Society*, p. 30.

² Here *C* (see diagram on p. 70) remains the same and *A* is replaced by *A'*.

³ Represented by *AC* in Fig. 2, p. 70.

⁴ Represented by *A* in Fig. 2, p. 70.

⁵ In this case *A* remains unaltered while *C* is replaced by *C'*.

⁶ In this case *M* alone is altered. The illustration is given by McDougall, *Social Psychology*, p. 41.

§ 4. SENTIMENTS

When an affective neurogram, *A*, is not innately linked with a cognitive neurogram, *C'*, but has become so connected by experience, we speak of the two together as the neurogram, *C'A*, of a *sentiment*,¹ not of an instinct. Thus, in McDougall's illustration, the child whose innate tendency was to love dogs but who, as the result of a terrifying experience, has come to fear them, has not got an instinctive fear of dogs, but has acquired a sentiment of fear for dogs, or for a particular dog as the case may be. The essential difference between an instinct and a sentiment is that the connexion between the cognitive (*C*) and the affective (*A*) neurograms is innate in the case of an instinct but acquired in the case of a sentiment.² In McDougall's view

the work of Pavlov³ and his disciples on the so-called 'conditioned reflexes' has been in reality the experimental study of the process of linking affective [neurograms] with simple cognitive [neurograms], or . . . the formation of very simple sentiments. . . . The assumption implied by the term 'conditioned reflex', namely, that the reflex secretion of saliva is alone involved in such acquired reactions, is a most unfortunate error. More careful and unbiassed observation shows clearly that the dog. . . does not merely secrete saliva; rather his attention is drawn to and fixed upon the food or upon the signals which precede its appearance; he cocks his ears and fixes his eyes expectantly and strives toward the food; and, if his movements are not confined. . . he runs

¹ The cognitive neurogram, *C'*, we may refer to as the cognitive part or element of the sentiment-neurogram. The object to which *C'* corresponds is spoken of as the object of the sentiment.

² McDougall, 'Symposium on Instinct and Emotion', *Proc. Aristotelian Society*, p. 30.

³ See above, pp. 62-64.

toward the place at which he has learnt to expect the food, using whatever movements may be necessary to circumvent or overcome obstacles.¹

Another difference between a sentiment and an instinct is that the neurogram of a sentiment may include several different affective neurograms linked to the same cognitive neurogram. Indeed, Mr A. F. Shand first applied the word 'sentiment' to 'an organised system of emotional tendencies centred about some object' or class of objects.² The effect of connecting a cognitive neurogram with one or more affective neurograms so as to form a sentiment is that, whenever the former is excited, the excitement tends to spread to the latter. When affective neurograms are excited the resulting visceral changes send back to the brain a multitude of impulses which greatly augment the excitement already there. If this spreads down an efferent path, the resulting movements will be more powerful because of the large volume of impulses in the motor neurograms. But the central excitement may first spread through further cortical paths, giving rise to a train of thought all the more vivid because of the intensity of the corresponding nervous processes. Although the spread of excitement, whether to cause powerful movements or vivid thought, may be controlled by the will, it is, as we shall see, in practice largely

¹ *Acta Psychologica*, Vol. II, No. 3 (1937), p. 335.

² Cf. McDougall, *Social Psychology*, p. 122. Shand's theory is set forth in *The Foundations of Character*. In the text we are taking the view of sentiments proposed by Stout and developed by McDougall. The differences between the rival theories are analysed in one of McDougall's last papers: 'Organisation of the Affective Life. A Critical Survey' (*Acta Psychologica*, Vol. II, No. 3 (1937), pp. 299-338). In Shand's view the connexions between the cognitive neurogram of the sentiment's object and the various affective neurograms are largely, if not wholly, innate. In McDougall's view they are acquired as the sentiment is formed.

determined by the conative elements in the sentiment that has been excited.

The power of any idea to direct thought and action thus largely depends on the extent to which the corresponding cognitive neurogram is linked to affective¹ neurograms. Morton Prince tells us that 'The impulsive force of the emotional dispositions or linked instincts becomes the conative force of the idea, and it is this factor which carries the idea to fruition'. He adds: 'This is one of the most important principles of functional psychology. Its value can scarcely be exaggerated. Without the impulse of a linked emotion ideas would be lifeless, dead, inert, incapable of determining conduct.'² And McDougall says that 'directly or indirectly the instincts are the prime movers of all human activity';³ while Bernard Hart speaks of 'the great primary instincts which constitute the principal driving forces of the mind'.⁴

Sentiments, or individually acquired cognitive-affective neurograms, are, as we shall see later, the functional units of character. But the formation of character involves the integration of all the sentiments in one hierarchical system in which, McDougall tells us, 'the dominating position is in most cases occupied by, and the controlling function exercised by, the highly complex sentiment peculiar to man, the sentiment of self-regard in all its protean forms, self-respect, pride, vanity, ambition, etc.'⁵

¹ Cf. Morton Prince, *loc. cit.* p. 447.

² *The Unconscious*, pp. 449, 450.

³ *Social Psychology*, p. 44.

⁴ *The Psychology of Insanity*, p. 165. Cf. Lord Haldane, in an address to the students of Edinburgh University: 'Without passion nothing great is, or ever has been, accomplished.' And George Eliot made Adam Bede say: 'It isn't notions sets people doing the right thing—it's feelings.'

⁵ *Acta Psychologica*, Vol. II, No. 3 (1937), p. 311.

We shall have more to say about the pedagogic¹ importance of the sentiments and of linking up ideas with emotions, or cognitive with affective neurograms. But we note here that the cerebral excitement accompanying and corresponding to a thought will also be increased if, instead of being linked to an instinct, the thought results in bodily (skeletal) movements of any kind. For the same diagram² will still represent the path of the nervous impulses, although *C* is now the neurogram whose excitement accompanies the original thought, *M* and the beginning of *A* are efferent paths to the muscles, while the end of *A* now represents the path of the impulses returning to the cerebrum from the kinaesthetic sense-organs stimulated by the movement.³ The value of the maxim 'learn by doing' lies in the fact that the excitement of a cognitive neurogram tends to recur more frequently, and to be more intense when it does recur,⁴ if this neurogram is linked with that of such a circular nervous process as brings back impulses from kinaesthetic sense-organs to reinforce the excitement of the brain. Just as, in Morton Prince's words, 'the linking of a strong affect tends to safeguard registration and conservation of experience', so also experiences are more strongly registered and conserved when they are linked to voluntary movements. If I want to remember a word or a phrase I do well to write it down although I may never read my note.

¹ E.g., Professor Gilbert Murray told a teachers' conference in the University of London on 3 January 1917: 'The teacher who aims at love but not knowledge is a washy educator. But the teacher who aims at knowledge without love is no educator at all.'

² Fig. 2, p. 70.

³ So *A* does not now include visceral arcs.

⁴ But for the time being—see p. 266 below—the doing finishes the learning.

The formation of a sentiment by linking affective neurograms to a cognitive neurogram does not merely increase the excitement whenever the object of the sentiment happens to come to mind. It also causes the cognitive neurogram to be excited much more frequently, so that the object is often thought of. The explanation will be considered later.¹ Meanwhile we note the fact, and observe that it enhances the effect on life and conduct exercised by the primary instincts through the sentiments of which they form part.

The formation of a sentiment and its consequences are thus described by McDougall:

I become aware that the man standing beside me has struck me; this cognition evokes in me angry feeling and an irresistible impulse to return the blow... my angry impulse may be checked by one of fear, which prompts me to retreat... as soon as I am out of danger, I may think again of the incident; I live through it again in imagination, as we say. This restores the angry impulse; which, finding no satisfaction, in turn keeps me thinking of my adversary: the insult rankles in my bosom... Quite involuntarily I find myself plotting out schemes of revenge... Up to the time of the incident I had been, we may suppose, as nearly as possible indifferent to my assailant; that is to say, his presence had evoked in me no well-defined feeling or attitude. But after the painful incident, I cannot think of him without fear, or anger, or both, and without desiring both to avoid him and to get the better of him in some way. Suppose, now, that circumstances repeatedly bring us together, and that his behaviour on such occasions is that of a bully covertly reminding me of the past insult that I dare not avenge. My attitude of blended anger and fear is renewed on each such occasion; and, being thus confirmed and rendered permanent, it becomes a full blown sentiment of hatred [the cognitive

¹ See below, pp. 112-114.

part of its neurogram corresponds to my assailant and the *two* affective parts to the instincts of which anger and fear are the 'affects']... The effect of such linkage is not only that, whenever the object of the sentiment is forced upon my attention, my thinking of him is coloured or suffused with these emotions, but also that I am rendered peculiarly apt to think of him. If I pass by a crowd of which he is a member, my eye singles him out and watches him furtively; if we both have occasion to attend the same board-meeting, I am acutely aware of him and of all he says and does, though I may avoid glancing at him; if I hear his name mentioned by others in conversation, I am all agog to hear what is said. And this may continue in spite of my best efforts to cast out this demon of hatred and to resume my former attitude of indifference. Again, all my thinking of my adversary is biassed by my attitude; whatever I hear to his discredit I accept and retain, and I attribute his actions to the meanest motives; until, by repetition of this process of selective thinking under the guidance of the specialised conative tendency, I come to think of him as a monster of iniquity.¹

The following is another example of the effect of a sentiment:

A man walking with a friend in the neighbourhood of a country village, suddenly expressed extreme irritation concerning the church bells, which happened to be pealing at the moment. He maintained that their tone was intrinsically unpleasant, their harmony ugly, and the total effect altogether disagreeable. The friend was astonished, for the bells in question were famous for their singular beauty. He endeavoured, therefore, to elucidate the real cause underlying his companion's attitude. Skilful questioning elicited the further remark that not only were the bells unpleasant but that the clergyman of the church wrote extremely bad poetry. The causal [sentiment] was then apparent, for the

¹ *Psychology, the study of Behaviour* (1912), pp. 105-16.

man whose ears had been offended by the bells also wrote poetry, and in a recent criticism his work had been compared very unfavourably with that of the clergyman. The [sentiment] thus engendered had expressed itself indirectly by an unjustifiable denunciation of the innocent church bells. The direct expression would, of course, have been abuse of the clergyman himself or of his works.¹

In the last quotation, Dr Hart wrote 'complex' where we used the word 'sentiment' instead. The morbid complex that plays so big a part in psycho-pathology is, indeed, essentially the same thing as a sentiment:² the neurogram of a complex, as defined by Hart,³ is merely a sentiment-neurogram to the cognitive part of which several other cognitive neurograms have become attached. Every sentiment tends quickly to become a complex in this wide sense of the word as used by Hart and Morton Prince. Since, however, the term 'complex' is most often employed in a pathological sense we shall do our best to avoid it in our study of normal people.

§ 5. INTERESTS

We shall need a name for any system of connected neurograms of which at least one is cognitive and at least one affective; and we can find no better way of describing such a system than as an *interest-system*. This use of the word

¹ Quoted by Hart (*loc. cit.* pp. 73, 74) from Dr C. G. Jung of Zürich.

² McDougall, 'Symposium', p. 40.

³ 'A system of connected ideas, with a strong emotional tone, and a tendency to produce actions of a certain definite character . . . is termed in technical language a "complex"' (*loc. cit.* p. 61). Neither Hart nor Prince (*loc. cit.* p. 266) uses the word 'complex' in its morbid sense only.

'interest'¹ accords with common speech. No one was ever able to say, 'I am interested in this or that group of objects'—the stars, let us say— unless he had thought a good deal about the object of this interest. His thoughts will have awakened his feelings: he will be awed by the starry heavens and appreciate how 'one star differeth from another star in glory'. Even if his thoughts have awakened no other emotion they will at least have linked up with his self-regarding sentiment² and the affects—such as humility, self-respect, pride, or ambition—that belong to it; for he would not otherwise feel personally interested. On the other hand, no one ever thought much about a group of objects, such as is perversely called a 'subject' in school or college, without having some emotional feeling for it or being able truthfully to say that he took an interest in it. Accompanying every thought about it is the excitement of some part, cognitive or affective or both, of its neurogram, the 'interest-system'.

A sentiment then, is a simple kind of interest, and a 'complex', in the extended sense in which the word is used by Hart,³ is another more intricate kind of interest. A 'hobby' would be represented neurographically by a still more elaborate interest-system.

We said just now that other cognitive neurograms tend to link up quickly with the cognitive part of a sentiment-neurogram. That is because the object of a sentiment is often

¹ Cf. Herbart: 'no sooner did the words' of the teacher's anecdote told to mind-wandering schoolboys 'awaken old thoughts, forming strongly-connected series with which the new impression easily combined, than out of new and old together a total interest resulted....' (*Psychologie als Wissenschaft*, § 128. Quoted by William James, *loc. cit.* Vol. I, p. 418.)

² See above, p. 77.

³ See above, pp. 80, 81, especially footnote 3 on p. 81.

thought of; and, every time this happens, the thought becomes connected with the other thoughts then in the mind. Their neurograms thus get linked up, not only with the cognitive neurogram of the object of the sentiment, but also with the affective neurograms of the sentiment itself.

This tendency of a sentiment to increase in complexity is only one example of the tendency of all neurograms to become linked together as the objects or feelings to which they correspond are thought of or experienced either together or in immediate succession. The *neurography* of any person—if we may so speak of all his neurograms¹—thus tends to become organised into interest-systems which increase continually both in extent and in complexity.²

But the growth of interest-systems is by no means wholly fortuitous. Objects connected with each other in the 'real' world³—a cause and its effect, for example; or the several properties of the same material; or different objects having the same property or arousing the same emotions—tend to

¹ As we speak of the geography of a region when we mean the sum-total of its physical features.

² 'We have to regard the brain of the adult as consisting of a great number of such systems and sub-systems of neurones, organised with various degrees of completeness and stability and interconnected with various degrees of intimacy. Some of the perceptual systems [neurograms] are congenitally organised, while others are built up by the course of the individual's experience. The statement that systems are congenitally organised does not necessarily imply that they are present fully developed at birth, but rather that they have an inherited tendency to develop along certain lines. The mental life of most of the animals must be regarded as almost purely perceptual and determined almost completely by congenitally organised perceptual systems. Man, too, has such congenitally organised systems, but he differs from the animals in that his long education greatly modifies his congenital systems and develops many new systems peculiar to each individual.' (McDougall, *Physiological Psychology*, pp. 105, 106.)

³ See below, Chapter II.

be thought about together and so to be represented by connected neurograms, which are equivalent in the brain to knowledge in the mind. The more perfectly a man's neurography is organised to represent the objects in the world as well as the relations between those objects, the more extensive and the more accurate will his knowledge be.

Different people who have studied the same subject or who follow the same calling are bound to have some of their interest-systems resembling each other. Other systems will be, in the main, peculiar to whomsoever they belong: for example, a system of neurograms preserving the record of a man's personal experiences over a certain period, or a system formed by chance connexions with the affective neurograms excited whenever he happens to be in a certain mood.

The effect of a man's interest-systems upon his thought and behaviour, and thus upon the further growth of his interest-systems themselves, is largely determined by his affective neurograms and the neurograms of sentiments and complexes in which they become synthesised.¹ The harmonious co-ordination of all these interest-systems, and especially of those in which the affective elements are strongest, is a first condition of effective action and consistent behaviour.² It is indeed an essential foundation of character. On the other hand, conflict between rival interest-systems or complexes is one of the principal causes of insanity.

We are about to study the spontaneous growth of interest-systems and then their voluntary development in the process of education. Meanwhile we observe that the neurograms

¹ Cf. Morton Prince, *loc. cit.* p. 536.

² See below, Chapter II.

of interests,¹ complexes and sentiments, permanent as they are when compared with the mental processes that result from their temporary excitement, are not indestructible. They tend, on the contrary, gradually to disintegrate when they have served their purpose, just as printers' type is distributed when its work is done.²

¹ The expression 'neurograms of interests' is here used as the equivalent of 'interest-systems'.

² Cf. Morton Prince, *loc. cit.* p. 306.

CHAPTER 5

INVOLUNTARY THOUGHT

§1. THE FIRST LAW:

PSYCHO-NEURAL PARALLELISM

THE neurograms we have been studying are partly innate and partly records of our own lives. They bring our past into relation with our present for the guidance of our future. How that is done is the next question we must face. As we look to see how one state of mind gives place to another we turn from psychostatics to psychodynamics and study the flow of consciousness. To ascertain the causes determining this flow is the ultimate aim of psychology.

Our problem is to formulate laws according to which our thinking proceeds. We do not speak of laws which 'govern our thought' because, as we have already observed,¹ a law of nature is not an active agent.

A person's thoughts at any moment largely depend upon his environment. Unless he is very busy indeed, a loud peal of thunder is sure to make him think of thunder. Even when sense impressions from outside or from inside his body do not determine his thought, they may still influence it. We shall have more to say later concerning the interruption and modification of trains of thought by incoming sense impressions. First, however, let us simplify our discussion by considering the case of thoughts that are subject to no outside

¹ See above, Chapter 1, p. 9.

interference. And let us make it simpler still by speaking, for the present, only of involuntary thinking.

Some of the following laws of thought we have already stated, so that we might describe neurograms and systems of neurograms without ignoring the question how they are formed and organised. For example, we have laid down the law of psycho-neural parallelism.¹ We now re-state it as follows: Excitement in one or more sensory regions of the brain accompanies every mental process. Or, in Huxley's words, *To every psychosis there corresponds a neurosis.*²

This, then, is our first law of thought: that whenever thinking goes on, brain arcs are excited in such wise that the nature of the thought at any moment is, subject to the fourth law,³ determined by the neurones that are then excited and by the degree of their excitement.

The system of brain paths followed by the excitement, together with its intensity at various parts of the system, thus define the thought at any moment. But this system of brain paths may include arcs of the higher level although their excitement does not affect consciousness.

If therefore we describe as 'sensory brain paths' those systems of arcs the excitement of which may affect consciousness, we may say with greater precision that it is the system of sensory brain paths excited at any moment, and the varying

¹ On p. 65 above. W. McDougall (*Physiological Psychology*, p. 167) states the law: 'some neural process invariably accompanies every state of consciousness.' He warns his readers against confusing the law of psycho-neural parallelism with the hypothesis of psycho-physical parallelism: see below, p. 116.

² Cf. W. James, *Principles of Psychology*, Vol. I, pp. 186, 243. This use of the words psychosis and neurosis is not to be confused with their use in medical literature to denote pathological conditions.

³ See below, p. 123.

degrees of excitement in different parts of this system, that define the thought then in progress. And it is reasonable to assume that the thought in the focus of consciousness at any moment corresponds to the part of this system then most intensely excited.¹ Moreover, the progressive changes in the distribution of the excitement determine the flow of consciousness.

On the other hand, the converse of our first law does not hold. It is not true that to every neurosis corresponds a psychosis. Experiments described by Spearman² show that, even when reasoning, one may not be aware of essential parts of the accompanying neurosis. The final thought follows from the brain processes, but not from the interim thoughts. So the old judge advised the new one never to give reasons for his decisions: 'the decisions will probably be right, the reasons will surely be wrong.'³ And Sir James Jeans tells how Clerk Maxwell, in his first contribution to the Dynamical Theory of Gases, set out to find a mathematical formula for the spread of the different molecules which make up a gas:

Maxwell, by a train of argument which seems to bear no relation at all to molecules, or to the dynamics of their movements, or to logic, or even to ordinary common sense, reached a formula which, according to all precedents and all the rules of scientific philosophy, ought to have been hopelessly wrong. In actual fact it was subsequently shown

¹ Cf. W. James, *loc. cit.* Vol. I, p. 283. If, however, as is not uncommon in pathological cases, there be a second (sub-conscious) neurosis to which no psychosis corresponds, the impulse passing in the second system of nervous arcs, or in some part of it, may be of greater intensity than any in the first system. (See M. Prince, *The Unconscious*, footnote on p. 343.)

² *The Nature of Intelligence*, pp. 185-93.

³ Cf. W. James, *loc. cit.* Vol. II, p. 365.

to be exactly right, and is known as Maxwell's law to this day.¹

§2. THE SECOND LAW: DIFFUSION

Introspection tells us that the flow of consciousness is continuous. 'Changes from one moment to another in the quality of the consciousness are never absolutely abrupt.'²

When thought is guided by will, its continuity is obvious enough. When thinking is involuntary, it is generally easy to trace the connexion between the states of consciousness at two moments separated by a short interval of time. Even when the stream of consciousness, as William James called it, seems to be cut off by a peal of thunder, the transition, however rapid, from the interrupted thought to the new one, is not to thunder *pure*, but to 'thunder-breaking-upon-silence-and-contrasting-with-it'; for 'into the awareness of the thunder itself the awareness of the previous silence creeps and continues'.³

Let us make a cross-section of this continuous stream of thought. At any moment some one thought, perhaps an idea of some object, is receiving most attention. It occupies the focus of consciousness. This thought is unlikely to be wholly devoid of meaning; and its meaning, as we saw,⁴ implies the existence of several associated thoughts of which we may be barely conscious. They are said to occupy the fringe of consciousness. If, to recall our previous example, an idea of Whitehall is in the focus of consciousness, some

¹ Jeans' essay on *Maxwell's Method* in *James Clerk Maxwell* (C. U. Press, 1931), pp. 97, 98.

² W. James, *loc. cit.* Vol. I, p. 237.

³ W. James, *loc. cit.* Vol. I, p. 240.

⁴ Above, pp. 58-60.

idea of the Civil Service in general, or of the particular Government Office best known to the thinker, will be likely to find a place on the fringe, and give to his idea of Whitehall part of the meaning it then has for him.

But the fringe of consciousness may also contain other thoughts that do not owe their presence to associations with the thought in the focus. It may, for example, include sense impressions: my thoughts must be very interesting if I do not notice being stung by a wasp. Or again, the fringe of consciousness may include elements belonging to some independent and, for the most part, unconscious stream of thought which momentarily obtrudes itself, as when the solution of a problem, pondered but left unsolved overnight, is about to flash into a mind now seemingly occupied with quite other matters.

So we may describe a typical cross-section of the stream of thought as showing (*a*) some thought in the focus of consciousness; (*b*) others, connected with the first and giving meaning to it, on the fringe; and possibly (*c*) other independent thoughts as well.

What now is the neural counterpart of all this? It consists, as we have seen, of excitement spreading along sensory brain neurones and across the synapses that connect them. As the distribution of excitement alters, as the neurosis changes, so also does the psychosis change. Our immediate problem is to formulate general laws according to which the neurosis changes, and then to see what our results imply for psychology.

We may start with a simple neurosis and watch it develop. Imagine a man awakened out of dreamless sleep by knocking on his bedroom door. As he begins to wake up, he is at first

aware of knocking pure and simple. The knocking has no meaning: it is just knocking, that and nothing more. The corresponding neurosis, we may take it, affects no sensory brain paths beyond the auditory centres. As he becomes more and more widely awake, he perceives that the knocking is on the door; that the door is the door of his bedroom; that he is being called; that it is time to get up; that he has this, that, and the other to do to-day. The neurosis extends at the same time. The excitement spreads from the auditory centres to visual arcs, where it gives rise, first to an image of the door, and then to images of objects, such as the bedroom, connected with the door. And, as the nervous impulses continue to advance along connected sensory arcs in the brain, they give rise to the associated thoughts: time-to-get-up and day's-work-waiting.

In some such way the simple knocking acquires meaning, and the simple neurosis in the auditory centres extends to a number of connected neurograms—of the door, of the bedroom, and the rest—where the excitement gives rise to this growing meaning. And, in general, the development on the fringe of consciousness of thoughts connected with the one in the focus is accounted for by the extension of the neurosis that corresponds to the focal thought.

This tendency of excitement to spread from any arc in which nervous impulses are moving to all systems of arcs linked to it by synapses with sufficiently low thresholds¹ is of great importance in our subject. The process is known as

¹ See above, p. 35. The synapse between two neurones acts as an insulator until the excitement is sufficient to cross the synapse and to start an impulse in the second neurone. Thereafter the resistance of the synapse at any moment depends, *inter alia*, upon the amount of excitement crossing it at that time.

diffusion.¹ The law of diffusion may be stated thus: *Excitement in any nervous arc tends to spread to every other arc that is connected to the first by synapses with thresholds low enough for that excitement to overcome.*² This law of diffusion is our second law of thought.

It follows from this law that the sufficient excitement of any part of a neurogram is commonly followed by the excitement of the whole.³ Thus, in Pavlov's experiments,⁴ it was only necessary to stimulate again any element in the neurogram in order to reproduce the whole process, including the excitement of the whole neurogram which in this case included arcs of the visceral system. The psychological consequence of diffusion is that any image—auditory, visual, olfactory, or whatever it be—of a familiar object tends to arouse all the other images which go to make a percept⁵ of the object, an idea of the object as a whole.

But, according to our statement of the law, the extent to which the excitement spreads depends upon the relation between the intensity of the excitement and the thresholds

¹ Cf. McDougall: 'The energy liberated in sensory neurones... diffuses itself.' (*Physiological Psychology*, p. 38.) Cf. also Bain: 'The organs first and prominently affected, in the diffused wave of nervous influence....' (*Emotions and Will*, pp. 4, 5, quoted by W. James, *loc. cit.* Vol. II, p. 373.) The process may also be described as 'complication': see McDougall, *loc. cit.* p. 100.

² Cf. W. James: 'It is hard to doubt the truth of the law of diffusion, even where verification is beyond reach. *A process set up anywhere in the centres reverberates everywhere, and in some way or other affects the organism throughout, making its activities either greater or less.*' (*Loc. cit.* Vol. II, p. 381.)

³ Cf. McDougall: 'The perceptual neural system is a complex of sensori-motor arcs of all three levels, and comprises arcs in two or more of the sensory areas of the cortex, and all these arcs are so intimately connected that excitement, initiated in any one of them, tends always to spread throughout the system.' (*Physiological Psychology*, p. 105.)

⁴ On pp. 62-64. See also p. 75.

⁵ See above, p. 47.

of the synapses; and this varies between wide limits.¹ If the brain is fatigued, the synaptic resistances are high and the diffusion is slight. The tired thinker finds that his ideas are lacking in wealth of meaning, his vocabulary is restricted, and his imagery poor. If, on the other hand, the nervous system is in a state of abnormal excitability, as in some cases of strychnine poisoning when the synaptic resistances are unusually low, 'a stimulus applied to any small group of sensory neurones may initiate an excitement which spreads throughout a very large part of the nervous system and throws almost all the muscles in the body into contraction':² a flash of light may suffice to produce convulsions. Or, if the excitability is normal but the excitement intense, the nervous impulses may be diffused more widely than usual, so that thoughts may become unusually rich in meaning, and capable of expression in uncommon language. Under the influence of strong emotion, any man may become a poet.

Diffusion thus accounts for the presence on the fringe of consciousness, and for the development, of thoughts that originate from, and give meaning to, the thought in the focus. The presence of other thoughts of independent origin may be due to the excitement of sensory brain arcs by impulses from the external sense-organs or from the viscera.

§ 3. THE THIRD LAW: CONVERGENCE

Our further account of the neural counterpart of a stream of thought may be simplified by the use of symbols. Let us denote a thought by a letter in black type (e.g. **A**), and let

¹ See above, p. 35.

² McDougall, *Physiological Psychology*, p. 33.

us use the same letter in *Italic type* (e.g. *A*) to denote the neurogram corresponding to that thought. It is true that the distribution of excitement in the neurogram, *A*, may vary from time to time, and that to each different distribution a somewhat different thought *A* will correspond. But, so long as we concern ourselves with comparatively simple neurograms, this source of error need not trouble us. The simpler the neurogram, the less can the distribution of excitement in it vary. Or, in psychological terms, while I may have many different ideas of my friend so-and-so, corresponding to various distributions of excitement in my complex neurogram of my sentiment for him, there is little room for change in my ideas of an object like the letter *Z*, of which, as I am neither a lexicographer nor a printer, my neurogram is simple.

Consider now an involuntary stream of thought. The thinker is making no attempt to direct his thinking. We may make a cross-section at any point, and follow the stream as it flows on beyond that section. Suppose that the cross-section shows an elementary thought *A* in the focus of consciousness, and other thoughts, *B*, *C*, *D*... on the fringe.

According to our second law, diffusion happens whenever the thresholds of the synapses are low enough for the excitement to overcome. Excitement may therefore diffuse from *B*, *C*,... as well as from *A*. To what extent, if at all, do separate streams of nervous impulses arise from these sources and continue to flow in separate neural channels?

It is clear that if the thresholds of the synapses between *A* and other neurograms *A*₁, *A*₂,... connected with *A* are too high for the excitement in *A* to overcome, no separate stream of impulses will start from *A*. What does happen to the

excitement of *A* in such a case will be explained directly.¹ Meanwhile, we may note the same fact in psychological terms: a thought without associations refuses to develop and to originate a stream of thought. For example, the Fuegians, when visited by Darwin in H.M.S. *Beagle*, betrayed no interest whatever in the brig. They saw it in the offing but did not look at it; it suggested nothing to them; it originated no train of thought. They had never seen its like before, and it could have no associations in their minds. But when they saw the ship's boats, it was quite another story; for the boats suggested their own efforts at canoe building and fascinated them at once.² In much the same way, a little boy may be left unmoved by the Gothic glories of King's College Chapel and yet be thrilled by his attempt to jump across the carpet where the two aisles meet.

When diffusion from *A* does take place it will not be uniform in all directions, for it will follow the paths of least resistance. If the separate streams of excitement continued on their several ways, they would ultimately issue down the pyramidal tract,³ giving rise to random movements having no common end and serving no useful purpose; and that, as we know from experience, does not happen.

It is therefore clear that thoughts on the fringe of consciousness, whether *A*₁, *A*₂, . . . due to the thought in the focus or *B*, *C*, . . . of independent origin, do not result in

¹ See below, p. 104. From the 'third law' there stated it follows that, if *B* is the next thought to occupy the focus of consciousness, the excitement of *A* is drained through *B*.

² See Darwin, *A Naturalist's Voyage round the World*, pp. 219, 229.

³ That action is the normal ending of every series of connected thoughts or, in neural terms, that all excitement of cerebral neurones tends ultimately to find an outlet down the pyramidal tract, is explained below in Chapter 13.

divergent streams of thought ending in discordant acts. The final act is not, however, the product only of the thought that was in the focus of consciousness a moment before. It is also affected by the thoughts that were on the fringe. For example, I am asked a question, to which, after a little reflection, I return an answer. My answer is the action that ends a sequence of connected thoughts, including the logical series on which I have concentrated my attention and which enabled me to reply to the question. This logical series has occupied the focus of consciousness. But it may not wholly account for my answer. My interlocutor may seem to be heckling rather than seeking for information, or I may be busy and dislike being interrupted, or I may be suffering from some physical ailment giving rise to sensations which appear on the fringe of consciousness but have no connexion with the train of thought arising out of the inquiry. In any of these circumstances the tone, and perhaps the wording, of my reply will betray an annoyance due to thoughts which never got beyond the fringe of my consciousness while I was thinking out an answer. Yet the answer when it comes is the integral result of all that has gone before. The excitement diffusing from all the active neurograms combines to produce a single movement, or a co-ordinated series of movements.

If the excitement diffusing from several neurograms will thus coalesce at the end of a train of thought, may not something of the same sort happen from time to time during the process of involuntary thinking? The psychic counterpart of this coalescence of excitement would be the contraction of the field of consciousness. It might then contain no more than one comparatively intense thought.

Introspection suggests that an alternate contraction and

expansion of the field of consciousness does indeed take place. Whoever will recall his experiences during a spell of involuntary thinking, or day-dreaming, will probably recognise the phenomenon. At one moment his thought was widening and becoming more full of meaning. A moment later one of the new thoughts began to distract his attention from all the rest until the new thought filled his whole mind. Then diffusion began again from this new starting-point. The sequence was perhaps repeated several times.

This pulsation in the stream of consciousness has been described by William James:

As the total neurosis changes, so does the total psychosis change. But as the changes of neurosis are never absolutely discontinuous, so must the successive psychoses shade gradually into each other, although their *rate* of change may be much faster at one moment than at the next.

This difference in the rate of change lies at the basis of subjective states. . . . When the rate is slow we are aware of the object of our thought in a comparatively restful and stable way. . . . As we take, in fact, a general view of the wonderful stream of our consciousness, what strikes us first is this different pace of its parts. Like a bird's life, it seems to be made of an alternation of flights and perchings. . . . The resting-places are usually occupied by sensorial imaginations of some sort, whose peculiarity is that they can be held before the mind for an indefinite time, and contemplated without changing; the places of flight are filled with thoughts of relations, static or dynamic, that for the most part obtain between the matters contemplated in the periods of comparative rest.¹

¹ *Loc. cit.* Vol. 1, p. 243. Cf. also McDougall: 'Mental activity or thinking thus tends to progress in cycles; each cycle begins with knowing, which excites feeling and striving; the striving results in a new knowing which satisfies the striving; and so the cycle reaches its natural termination in a feeling of satisfaction.' (*Psychology*, p. 62.)

The changes in the neurosis correspond, as William James says, with those in the psychosis. The excitement diffusing from one or more active neurograms, in accordance with our second law, does not continue to follow divergent paths. On the contrary, it converges from time to time upon a single neurogram and causes the corresponding thought to fill the mind.

The thought that distracts attention from others has, as a rule, something special about it. It may have some emotional association, a link perhaps with some interest. Or its potency may be due to 'facilitation',¹ because its neurogram has been doubly excited. That happens when two trains of thought meet in the same word. If I am occupied in felling a tree and paying no attention to a near-by conversation, I may vividly notice the word 'branch' spoken by one of the talkers even though it was a Branch of some society that he mentioned.²

The intensity of excitement in each successive neurogram during involuntary thinking is partly due to its own affective elements, and partly to the stimulus it receives from outside in the shape of excitement spreading to it from other neurograms. This in turn depends partly on the thresholds of the synapses leading to it, and partly on the alternative paths that are open. The thresholds themselves are not constant;³ and the alternative paths are constantly changing.

All these factors combine to determine whether a particular

¹ Or 'summation'. 'If the stimuli (single-break shocks) applied to two afferent nerves are reduced so that either alone is just too weak to elicit a [spinal] reflex response, there may be a small response when the stimuli are applied at a short interval apart.... The excitatory condition produced by one... sums with that produced by the other' (Creed and others, *Reflex Activity of the Spinal Cord* (1932), p. 31).

² See below, p. 103.

³ See above, p. 35.

neurogram shall be excited at any moment, and if so what the intensity of its excitement will be. But, as we shall see, whenever a particular neurogram does, for any reason, become intensely excited relatively to other active neurograms, it tends to drain the excitement of them all; and the object corresponding to this neurogram comes into the focus of consciousness.

William James first suggested that the interruption or 'inhibition' of the passage of excitement through one system of arcs by excitement discharged through another system was a phenomenon akin to the 'draining or siphoning of certain channels by currents flowing through others'.¹ McDougall has elaborated the theory of inhibition by drainage.² He holds that the intense excitement of any perceptual

¹ *Loc. cit.* Vol. II, p. 373.

² He thus applies his theory to explain the reciprocal innervation of antagonistic muscles, e.g. the extensors and flexors of the elbow. He writes:

'Let us imagine each arc in a simple schematic form as a chain of three neurones afferent (a_1), central (a_2), efferent (a_3), and let us call them a_1 , a_2 and a_3 , and b_1 , b_2 and b_3 , in the two arcs respectively (Fig. 3). When a strong stimulus is applied to the afferent neurone of arc a , it generates

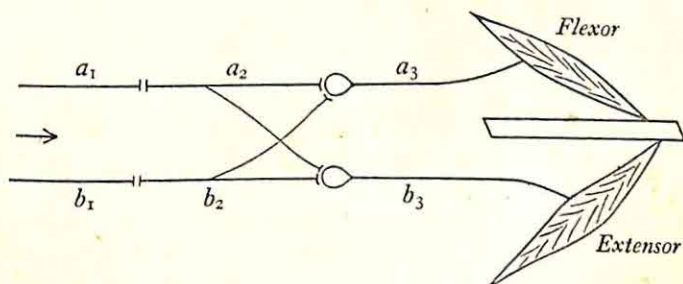


FIG. 3

neurin rapidly, so that it becomes very rapidly charged, and the resistance of synapse a_1 - a_2 is lowered until a series of discharges takes place from a_1 to a_2 , and again from a_2 to a_3 . The problem is, then, to imagine such a

system including higher level arcs will cause that system to drain the excitement from all other arcs of the higher level; and that the same is true of *connected* arcs belonging to other levels. When, for example, impulses have been travelling in a reflex arc to a flexor muscle of the knee or of the elbow, and some new stimulus interrupts their flow and replaces it by that of impulses to the corresponding extensor muscle, McDougall describes the former impulses as having been drained by the latter. But we must take care lest we read too much into this description.¹

mode of connection between arc *a* and arc *b* as will cause arc *a* during stimulation to drain off from the afferent and central neurones of *b* the smaller quantities of neurin generated in them. Several forms of such a connection may be imagined, but I think that probably it takes the form of a collateral fibre coming from neurone *b*₂, and taking part with the axon of *a*₂ in forming a synapse with *a*₃. Whatever the exact constitution of this synapse may be, we may assume that, when its resistance is lowered by the stimulation of *a*₁, and consequent charging of *a*₂, the collateral *b*₂, making connection with *a*₃, through this synapse, becomes the path of least resistance for the escape of neurin from *b*₁ and *b*₂. These neurones are therefore drained by *a*₃, while *b*₃ ceases to receive any neurin from *b*₂ and the tone of the muscle group supplied by it is abolished. In a similar way, if both *a*₁ and *b*₁ be stimulated, but one more strongly than the other, the more strongly stimulated arc will drain the afferent and central neurones of the less strongly stimulated arc, because the resistance of synapses of the former will be reduced to a lower level than that of the synapses of the latter.' (*Brain*, Part CII (1903), p. 153. Quoted by Sherrington, *The Integrative Action of the Nervous System*, pp. 200, 201.)

In Sherrington's view (*loc. cit.* p. 201) this scheme of McDougall's fits a number of facts of reciprocal inhibition and also accounts 'very lucidly' for certain phenomena of alternating reflexes, which are common as spinal reactions. And it accords with the results of Sherrington's own experiments with strychnine and tetanus toxin. (*Proc. R. S.* Vol. LXXVI, pp. 161 and 269 and previous 'Notes' in Vols. LII, LIII, LX, LXI, LXIV and LXVI.) Sherrington adds, however, that, in his thinking, certain difficulties still attach to McDougall's view.

¹ McDougall's explanation suggests that when excitement has been passing down *b*₃ and is afterwards, because of a strong stimulus applied to *a*₁, redirected down *a*₃, the effect of the previous stimulation of *b*₁ will be to increase the total flow of excitement in *a*₃. In fact, however, the

McDougall points out that, since two unconnected thoughts cannot both be in the focus of consciousness at the same moment, the arrival of the one must involve the withdrawal of the other. 'We must suppose', he writes, 'that systems of arcs of the higher levels are more freely interconnected than those of the spinal level (where, as we have seen, this tendency to reciprocal inhibition obtains only between certain pairs or small groups of systems), so that the free discharge of any one system in the forward direction¹ drains any other higher level system.'² McDougall proceeds: 'There are many good reasons for accepting this view of the inhibitory process. Firstly, it is applicable to the inhibitory processes of the spinal level, and evidence directly supporting it is afforded by the

previous stimulation of b_1 will render necessary a stronger stimulus to a_1 in order to replace extension by flexion. This difficulty may be overcome if we suppose that the collaterals shown in McDougall's diagram carry fractions α and β respectively of the impulses traversing the second halves of a_2 and b_2 respectively. Then, if E and F are proportional to the stimulation of a_2 and b_2 respectively, the excitement—perhaps the amount of acetylcholine—in the neighbourhood of the motor cell bodies a_3 and b_3 respectively will be proportional to $E + \beta F$ and $F + \alpha E$. If we assume with McDougall that the flow will take place into a_3 or into b_3 as excitement crosses the synapse to a_3 more or less easily than that to b_3 , it follows that the extensor (b) muscles will prevail over the flexors (a) so long as

$$F + \alpha E > E + \beta F \text{ or } F > \frac{1 - \alpha}{1 - \beta} E.$$

This inequality implies that the more strongly extensor muscles are innervated, the stronger will have to be a stimulus to the afferent neurone of arc a in order to replace extension by flexion. We remind ourselves again that the eventual excitement in a_3 , when flexion takes the place of extension, is not simply the sum of the excitement in a_2 and in b_2 ; for a_3 does not drain the impulses from a_2 and from the collateral of b_2 in a quantitative sense: see above, p. 34.

¹ I.e. towards the Rolandic cortex. See p. 41 above, and the fifth law on p. 260 below, and the passage quoted from William James on p. 260 below.

² *Physiological Psychology*, p. 132.

study of such processes in the sensory level. Secondly, if we do not accept it, we have to invoke the aid of "inhibitory centres", and find ourselves in inextricable difficulties... Thirdly, and this is the most important point, the hypothesis of inhibition by drainage offers a satisfactory solution of that crucial problem, the direction of the discharge from the one perceptual system [neurogram] α to any other β excited in the succeeding moment. For it is the flow of energy [excitement], drained from α by β , that establishes a path of low resistance between them.¹ 'The excitement of one perceptual system thrown into activity inhibits the activity of all others, because it becomes the path of lowest resistance for the discharge of energy [excitement] from the sensory to the efferent side of the whole cerebral system.'² 'The hypothesis of inhibition by drainage seems to be the only one that can interpret these facts of reciprocal inhibition in the higher brain levels.'³

Let us see how the facts of experience fit McDougall's theory that a nervous arc of the higher level, when sufficiently excited, drains the excitement from all other active arcs. 'A faint tap *per se*', writes William James, 'is not an interesting sound; it may well escape being discriminated from the general rumour of the world. But when it is a signal, as that of a lover on the window-pane, it will hardly go unperceived.'⁴ As the longed-for signal and its meaning have been imagined over and over again, the tap neurogram is already excited by expectation. The tap itself, when it occurs,

¹ *Loc. cit.* p. 133. Cf. above, p. 57.

² *Loc. cit.* p. 105. McDougall adds that the 'activity of the dominant system is thus augmented by the energy that it drains from itself to other parts'. But we need not follow McDougall so far as to speak of 'energy' or to assume that the excitement drained from α to β adds to the flow through β .

³ *Outline of Psychology* (1923), p. 280.

⁴ *Loc. cit.* Vol. 1, pp. 417, 418.

adds to the excitement of this neurogram, through which (according to McDougall's theory) the impulses from all the active arcs are then drained; and the lover's tap drowns every other thought. 'We easily see now why the lover's tap would be heard—it finds a nerve-centre half ready in advance to explode. We see how we can attend to a companion's voice in the midst of noises which pass unnoticed though objectively much louder than the words we hear. Each word is *doubly* awakened; once from the lips of the talker, but already before that from within by the premonitory processes irradiating from the previous words, and by the dim arousal of all processes that are connected with the "topic" of the talk. The irrelevant noises, on the other hand, are awakened only once.'¹ This is the process known to physiologists as 'facilitation' or 'reinforcement'.²

Again, if an exciting thought suddenly occurs to one who is engaged in any form of physical activity, his movements are apt to be affected. They may become more vigorous, as when singing in church a man becomes the happy recipient of a bright idea, and is surprised to find that he has suddenly raised his voice above those of all his neighbours.

Or again: 'Everyone is familiar with the *patellar reflex*, or jerk upwards of the foot, which is produced by smartly tapping the tendon below the knee-pan when the leg hangs over the other knee. Drs Weir Mitchell and Lombard have found that when other sensations come in simultaneously with the tap, the jerk is increased. Heat, cold, pricking, itching, or faradic stimulation of the skin, sometimes strong optical impressions, music, all have this dynamogenic effect,

¹ W. James, *loc. cit.* Vol. I, p. 450.

² See above, p. 98, especially the first footnote.

which also results whenever voluntary movements are set up in other parts of the body, simultaneously with the tap.¹ Once more: 'Everyone knows that under the influence of powerful emotion, whether of joy, anger, or fear, there is discharged an increase of energy to the muscles, sometimes of an intensity which enables an individual to exert force of which he is ordinarily incapable.'² But the effect of distraction, whether from involuntary thought or from sense impressions, may be to diminish instead of to increase the activity in progress.³

McDougall's theory thus fits and co-ordinates a number of facts of introspective and experimental psychology, as well as of experimental physiology. We shall shortly see that it resumes and enables us to predict other facts that we have still to notice. Now, to 'enable us to resume and predict a vast number of facts... is the sole justification which a scientific law is ever required to possess'.⁴ We shall therefore summarise McDougall's theory by our third law of thought: *Of all neurograms that include arcs of the higher level, the most excited tends to drain the excitement from the others.* The same is true of other *connected* neurograms.

¹ W. James, *loc. cit.* Vol. II, p. 380. See also further examples of reinforcement—and especially of 'the overflow of reflex action into channels belonging primarily to other reflex-arcs than that under stimulation'—given by Sherrington, *loc. cit.* p. 175.

² M. Prince, *The Unconscious*, pp. 433, 434.

³ Cf. W. James, *loc. cit.* Vol. II, p. 379. He quotes M. Féré: 'The strength of contraction of the subject's hand was measured by a self-registering dynamometer. Ordinarily the maximum strength, under simple experimental conditions, remains the same from day to day. But if simultaneously with the contraction the subject received a sensorial impression, the contraction was sometimes weakened, but more often increased.'

⁴ B. Hart, *The Psychology of Insanity*, p. 15. See also p. 9 above.

Just as the second law (of diffusion) accounts for the expansion of the field of consciousness, so this third law (of convergence) explains its contraction. Diffusion followed by convergence and convergence by diffusion is like an ebb and flow of the tide of consciousness.

We have already (see above, p. 98) noticed some of the causes that may lead a particular neurogram to become more excited than others, and so bring its corresponding thought into the focus of consciousness. We have now to look more closely at these causes and their effects. We take first the *direct stimulation* of sensory end organs. A violent sensory impression will always attract attention to itself, away from other objects, unless the other thoughts in progress at the same time are of peculiar intensity. But these thoughts may be so absorbing, as, in William James' words, 'not only to banish ordinary sensations, but even the severest pain'.¹ He goes on to quote Sir William Hamilton:

Archimedes, it is well known, was so absorbed in geometrical meditation that he was first aware of the storming of Syracuse by his own death-wound, and his exclamation on the entrance of the Roman soldiers was: *Noli turbare circulos meos!* In like manner Joseph Scaliger, the most learned of men, when a Protestant student in Paris, was so engrossed in the study of Homer that he became aware of the massacre of St Bartholomew, and of his own escape, only on the day subsequent to the catastrophe. . . . And it is reported of Newton that, while engaged in his mathematical researches, he sometimes forgot to dine.²

¹ *Loc. cit.* Vol. I, p. 419.

² Sir W. Hamilton, *Metaphysics*, Lecture XIV, quoted by W. James (*loc. cit.* Vol. I, p. 419), who adds: 'The oft-cited case of soldiers not perceiving that they are wounded is of an analogous sort.'

The second way of intensely exciting a neurogram is by means of the 'circular nervous process' illustrated by the diagram on p. 70. This process amplifies the excitement whenever the affective part of an instinct-neurogram is stimulated. Terrify a man, or annoy him sufficiently, or, if he is in love, mention the name of his sweetheart, and his emotion—fear, or anger, or tender emotion—will combine with his thought of its object to drive all else from his consciousness. In fact, an *instinct-neurogram*, whenever and how-ever it is stimulated, *tends to drain the excitement* and to bring into the focus of consciousness any object which is linked, innately or as the result of experience, with the affective part of the instinct.

Thirdly, *multiple stimulation* of any neurogram produces a higher degree of excitement than would be produced by one of the stimuli acting alone. This is akin to the process, already described,¹ of facilitation or reinforcement in arcs of the spinal level. As another example of the process, suppose that I am listening to a lecture, and that some remark of the speaker starts in my mind a train of thought different from his. I may pursue it until a word of the lecturer fits my own thinking. This word is then, as William James says, doubly awakened. Its neurogram drains the excitement and my attention returns to the lecture.

Sherrington's experiments on spinal dogs² prove that multiple stimulation or facilitation may cause an arc of the spinal level to drain excitement from *connected* arcs. He showed further that the excitement of two neurograms of the spinal level might combine to stimulate a third connected

¹ On pp. 98 and 103 above.

² See Sherrington, *loc. cit.* fig. 38, p. 119 and p. 123.

with them both; and that, for this to happen, they need not be stimulated at the same moment, provided that the second was stimulated not too long after the first.¹ The fact that a spinal neurogram remains excited for a finite period of time was clearly proved by experiments on reflex 'after-discharge'.² It suggests that higher level neurograms also remain active for some time after being excited. There is one class of higher level neurograms of which this is obviously true, namely instinct-neurograms.

In psychological language it is said that the emotion, once excited, tends to maintain itself until exhaustion ensues, or until it has achieved its object.³

Fear, and the bodily symptoms of fear, provoked by a sudden and momentary impression, persist for some little time, [even when] the harmless character of the disturbing incident is at once realised. Hence the sudden anger dies slowly away, though its cause be removed, and is apt to vent itself upon the unoffending. Hence the tears and lamentations may continue to flow though the cause of grief no longer exists. This slow passing away of the emotional state is of course best displayed by children, as by the child who continues to sob in his mother's arms though he has realised that the terrifying face or the growling wild beast was only his elder brother in disguise.⁴

But, while the 'after-discharge' of higher level neurograms is most manifest and probably of longest duration in the case of instinct-neurograms, there is no reason to doubt that

¹ *Loc. cit.* pp. 123, 124.

² *Loc. cit.* Lecture 1, pp. 26-35. When the reflex was evoked by a strong stimulus, the excited arcs would go on discharging the impulses that produced the reflex movement, sometimes for as long as 10 or 15 seconds (*loc. cit.* p. 30) after the stimulus had been discontinued.

³ W. McDougall, *Physiological Psychology*, p. 115.

⁴ *Loc. cit.* p. 116.

it occurs in other cases also. The utterance of the lecturer whose argument I had ceased to follow will still serve to recall my wandering attention if, instead of synchronising with a similar element, **A** say, in my own train of thought, it follows after not too long an interval; and the neurogram **A** must have continued active in the meantime.

We may take it, then, that every interest-system maintains its activity for some time after being excited. This is a most important principle. For it means that when once any considerable interest-system—especially if it be rich in emotional elements—has been stimulated, it will tend for some time to reinforce the excitement of any neurograms connected with it, and so to make the excitement of other higher level arcs drain through them. An interest thus tends to bring into the focus of consciousness whatever thoughts have any connexion with it. An excellent example is furnished by Poincaré's description of how the discoverer's interest in his subject, and especially in the general trend of the argument, exercises a selective influence upon his involuntary thoughts, tending to bring into his field of consciousness only those that fit in with the general trend of the argument.¹

The continued activity of an interest-system once excited has an important bearing on education as well as on mathematical and other research. It is essential to good teaching that the teacher should awaken his pupils' interest in his subject. His exposition may then be helped by this interest to guide their thoughts, to stress those that are connected with it, and thus to build it harmoniously up 'so that the mind can, without effort, take in the whole without neglect-

¹ Poincaré, *Science and Method*, pp. 49-52.

ing the details'.¹ As Herbart wrote² of the teacher's anecdote told to the schoolboys whose minds were wandering: 'No sooner did the words awaken old thoughts, forming strongly connected series with which the new impression easily combined, than out of new and old together a total interest resulted which drove the vagrant ideas below the threshold of consciousness, and brought...settled attention into their place.'

On the other hand the continued activity of an interest-system may give 'bias' to one's thoughts. If we argue with a party politician, his political interest will be excited and will then 'reinforce in his mind those arguments which support the view of his party'.³ And all my thoughts about a man I dislike are apt to be biased by my sentiment of hatred.⁴

We see then how multiple stimulation may cause a particular neurogram to drain the excitement from other higher level arcs. In each of our examples, the neurogram upon which the excitement thus converged was directly connected with an active interest-system. But the mere connexion of a neurogram with an interest-system, even if inactive, will tend to make that neurogram drain the excitement from other arcs of the higher level.

Suppose that a neurogram A is connected, by equal and similar synapses, with two neurograms B and B' , and that these in turn connect respectively with neurograms C and C' . Suppose, however, that the system BC differs from the system $B'C'$ by including affective elements represented by the circle DE in the diagram (Fig. 4). As the affective neurogram DE is excited from B , it in turn adds to the excitement

¹ Poincaré, *loc. cit.* p. 59.

² Quoted on p. 82 above.

³ Cf. B. Hart, *loc. cit.* p. 65.

⁴ See above, p. 80.

of the system BC , by reason of the impulses arriving from the viscera by arcs represented by the E part of the circle.¹ BC thus becomes more excited than $B'C'$ and drains excitement

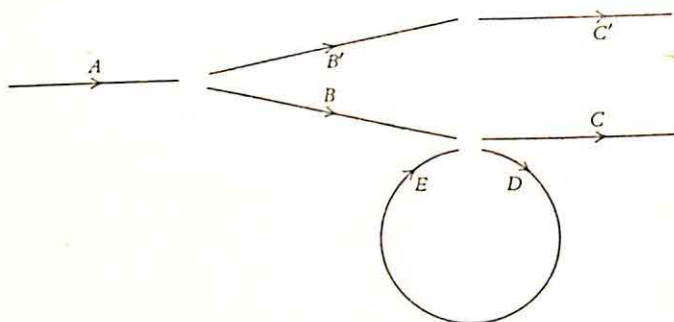


FIG. 4

from it. Thus the mere fact that B is connected with affective neurograms, while B' is not, suffices to cause B to drain excitement from B' .

Generalising this result we see that, of all neurograms connected with A , that one which is itself connected to, or forms part of, the widest and deepest interest-system tends, other things being equal, to attract and drain the impulse from A . If now we suppose that there are active neurograms in addition to A from which excitement is spreading, we finally arrive at the following corollary to our third law: *Of all active neurograms involving higher level arcs, that which is connected with (or forms part of) the widest and deepest interest-system tends, other things being equal, to drain the excitement from the rest.* The psychological counterpart of this corollary is: *Of all thoughts on the fringe of consciousness at any moment, that one which is connected with the widest and strongest interest tends, other things being equal, to enter*

¹ Cf. above, p. 70.

the focus and receive attention; or, more simply and loosely, we tend to think of things that interest us.

It is those interests which arouse most emotional feeling that are generally the most potent in guiding thought. The corresponding interest-systems tend to be 'deepened', or to have their internal synaptic thresholds lowered, every time the neurograms belonging to the system are excited with the stirring of deep emotion. To an interest that stirs deep emotion, a deep interest-system tends to correspond; and, the richer the system is in affective elements, the deeper it is likely to be.

From a neurogram connected with a wide and deep interest-system excitement tends to spread throughout the system, and the spread takes place more quickly the stronger the excitement becomes. That thought moves quicker under a strong stimulus is suggested by introspection. The suggestion receives experimental support from the work of Eccles and Sherrington.¹

§ 4. THE THIRD LAW AT WORK: EXAMPLES OF CONVERGENCE

William James observed that connexion with an interest-system, even if inactive, tended to make a neurogram drain the excitement from other higher level arcs and so to bring

¹ 'Studies on the flexor reflex. I. Latent period', *Proc. R. S. CVII B* (1931), p. 511, quoted by Creed and others, *loc. cit.* pp. 37, 38. They found that the more intense the excitation of a motor neurone, the shorter the delay of the excitement in crossing the synapses between the afferent and efferent neurones is likely to be. 'Hence', they add, 'the shorter latent periods of stronger reflexes.' Perhaps the application of strychnine or an increase in the excitement of a higher level neurogram will quicken the spread of excitement among the neurones of the brain.

its object into the focus of consciousness.¹ He cites cases in which a thought 'takes the initiative and draws our attention to itself, not by reason of its own intrinsic interest, but because it is connected with some other interesting thing'.² He comes to the conclusion that 'in mature life we never attend to anything without our interest in it being in some degree derived from its connexion with other objects'.³... 'What-we-attend-to and what-interests-us are synonymous terms.'⁴ The facts, adds Poincaré, that attract physicists and 'interest them are those... that have an analogy with many other facts and do not appear to us as isolated, but as closely grouped with others'.⁵

We come back once more to Herbart's description of how the influence of an *active* interest-system accounts for the maintained attention of disorderly pupils during their teacher's anecdote. At other times, the 'instruction being uninteresting, and discipline relaxed, a buzzing murmur was always to be heard, which invariably stopped for as long a time as an anecdote lasted. How could the boys, since they seemed to hear nothing, notice when the anecdote began?'⁶ We now have the answer. So soon as the neurograms excited (although very slightly, so that the corresponding thoughts never got beyond the fringe of an inattentive boy's consciousness) by the teacher's talk began to have connexions with an interest-system, although inactive, these neurograms tended to drain the impulse from all the others

¹ *Loc. cit.* Vol. I, p. 417. He adds: 'The impression draws an interest from them, or perhaps it even fuses into a single complex object with them.'

² *Loc. cit.* Vol. I, p. 449.

³ *Loc. cit.* Vol. I, p. 434.

⁴ *Loc. cit.* Vol. II, p. 559.

⁵ Poincaré, *loc. cit.* p. 27.

⁶ Herbart, *Psychologie als Wissenschaft*, § 128, quoted by W. James, *loc. cit.* Vol. I, p. 418. See above, pp. 82 and 109.

then active. Thus the corresponding thoughts came into the focus of consciousness. The interest-system was at the same time rendered active and maintained the boys' attention so long as it kept on being re-excited by the anecdote.

Or suppose that my hobby is photography. 'It is obvious that the existence of this hobby will continually affect the flow of my consciousness.'¹ Even if I have not been thinking of photography for some time, so that my photography interest-system is inactive, 'scenes which would otherwise be indifferent to me will frequently arouse interest as possible material for a picture: if I peruse a newspaper an article upon photography will at once arrest my attention'.²

Or suppose, with McDougall, that, being interested in animal behaviour, my glance falls upon a cat seated on the back of a pony. I may not have been thinking of animal psychology for a long time, and my interest-system may be quite inactive, yet, 'out of all the details of the scene presented to my vision, my mind seizes upon these two objects and their relation'. Had the cat 'been seated on the ground at some little distance from the pony, I should have noticed both animals only in the most fleeting fashion, if at all'. It is only because, in their attitude of friendliness, 'they mean for me far more than is actually presented to the eye, that the situation appeals to an interest and draws my attention'.³

Or again, going back to the 'monster of iniquity',⁴ my

¹ Cf. B. Hart, *loc. cit.* p. 61.

² B. Hart, *loc. cit.* p. 61. Jung's experiment, cited by Hart (*loc. cit.* p. 70), further illustrates the influence of inactive interest-systems, for it shows how the connexion of a thought (in this case a word pronounced by the experimenter) with an interest-system may distract the attention of persons experimented on from the business in hand—that of replying with a 'reaction-word'—and so delay the response.

³ *Psychology*, p. 101.

⁴ See above, pp. 79, 80.

sentiments of hatred may be quite inactive, I may not have seen or thought of him for some little time, and yet, 'if I pass by a crowd of which he is a member, my eye singles him out'; 'if I overhear his name mentioned by others in conversation, I am all agog to hear what is said'.¹

We have already² noticed the bearing on the teacher's art of the fact that connexion with an active interest-system increases the likelihood of any neurogram, directly excited by the teacher, draining the excitement and so bringing the corresponding thought into the focus of consciousness. The more general proposition stated in the corollary to our third law, and illustrated by the foregoing examples, has pedagogic consequences of even greater importance.

That corollary tells us that, in involuntary thinking with which alone we are as yet concerned, we are most likely to think of things that interest us. Their neurograms are connected with interest-systems. The more extensive and richer in affective elements these interest-systems, the greater is our tendency to think of things connected with these interests.

Now, an 'inactive' interest-system becomes active in the process of causing a connected neurogram to drain the impulse. It follows, as is indeed obvious to introspection, that wide and deep interest-systems³ are peculiarly liable to be rendered active. So long as the activity of an interest-system continues, other objects whose neurograms are connected with the system are especially likely to receive attention. Whenever their neurograms drain the excitement, their connexions with the system become deeper, the connecting synapses having their resistances permanently

¹ W. McDougall, *Psychology*, p. 116.

² Above, p. 108.

³ See above, p. 111.

lowered in some degree by the transfer of excitement across them in the process. The neurograms of other thoughts, in the field of consciousness at the moment of draining also become connected with the interest-system as all are drained together. Thus an interest-system tends to grow. And the tendency is the greater, the wider and deeper the system already is. Moreover, as we shall see later,¹ the instinct of curiosity, with the emotion of wonder that forms part of it, helps interest-systems to grow both wider and deeper.

When part of an interest-system is excited the excitement tends to spread to other parts, because the constituent neurograms are linked up by synapses with low thresholds. Every time this happens these thresholds become lower still. Other things being equal, the synapses that have belonged to the interest-system for the longest time will have had this happen to them most often. Their thresholds will therefore tend to be the lowest of all. These synapses will also be most central, if the interest-system is conceived as growing from inside outwards as further neurograms are added to different parts of it from time to time. An interest-system therefore tends to be deepest in the centre. From any neurogram on the outside of it, the excitement tends to flow towards the heart of the system.² This conclusion has, as we shall see later,³ an important bearing on the problem of training character.

¹ See below, Chapter 12.

² The argument of this paragraph is set out more fully on pp. 177 and 178 below.

³ See below, Chapter 15.

CHAPTER 6

SOUL AND BODY

§ 1. PSYCHO-PHYSICAL INTERACTION

IN the last chapter we have been concerned with involuntary thinking. Is this the only kind? Many psychologists and physiologists believe that 'if we could completely describe the structure of the nervous system of any man or animal, and had a complete knowledge of the laws of the physical and chemical processes that occur in it, we should be able to account completely for all the conduct of that individual'.¹ Are they right? Or were we right in adopting² the 'common-sense' view that human souls exist and influence human behaviour?

The former opinion is held in several forms. Some of its supporters follow Huxley in supposing that our thoughts—whether perceptions, images, feelings or volitions—as such, have no influence upon our conduct; that they are mere 'epiphenomena', caused by, but not reacting upon, neural activities in the brain. Others say that the psychoses and the neuroses form two series that run parallel to one another but never meet or interact. And others again hold that the physical and the psychical are two modes in which one series of real events appears to us, and that therefore the two series of appearances run parallel to one another. Hence this view, in its second and third forms, is known as the 'hypothesis of psycho-physical parallelism'.

¹ McDougall (*Physiological Psychology*, p. 7) thus formulates a view which he characterises as questionable and paradoxical. The following paragraph, concerning the hypothesis of psycho-physical interaction and its alternatives, closely follows McDougall's account.

² See above, p. 19.

Others, again, there are who deny that we need to let this question trouble us. They are not interested in it. The so-called behaviourists are only concerned to understand human behaviour. They believe that all behaviour is mechanically determined by reflex processes: 'let me get on with the study of "conditioned reflexes"'.¹

The alternative to epiphenomenalism, as well as to psycho-physical parallelism, is the hypothesis of psycho-physical interaction. According to this view, soul and body, or psychical and physical processes, act and react upon one another so that I—myself, my soul, or my ego—may play a part in determining my conduct. And this view is not merely the common-sense view, as we have called it. It is not confined to the man in the street or to old-fashioned philosophers, but is shared by some of those who have done most to advance psychological science.

Thus McDougall² has argued that the hypothesis of interaction is, *a priori*, more reasonable than that of parallelism or epiphenomenalism. William James has declared his belief in psycho-physical interaction, but rather for ethical³ than for logical or psychological reasons. Bernard Hart and Spearman are on the same side.⁴ Morton Prince agrees that volition can govern conduct.⁵

¹ McDougall, *Outline of Psychology*, p. 26, quoting Dr J. B. Watson, *Psychology from the Standpoint of the Behaviourist*.

² *Physiological Psychology*, p. 11. The argument concludes: 'We are then logically compelled to believe that neural processes and psychical processes are causally related according to ascertainable laws.'

³ *Principles of Psychology*, Vol. 1, p. 454.

⁴ 'Many of us', they write, 'are looking forward to the day when psychological text-books will become less exclusively pre-occupied with sensations and epistemology, but turn rather to appreciating the mind or "soul" as the agent in conduct.' (*Brit. J. Psych.* Vol. v, p. 77.)

⁵ *The Unconscious*, p. 458.

It is true that many very distinguished names might also be cited in support of parallelism or epiphenomenalism. We are not here concerned to strike a balance between divergent opinions. We do well, however, to note that neither the interactionists nor those who hold a contrary view are able to give conclusive evidence in support of their opinions. 'The result is two conceptions of possibility'—that interaction does, and that interaction does not, take place—'face to face, with no facts definitely enough known to stand as arbiter between them'.¹ Any decision between the opposing theories must therefore be provisional. But some decision, however tentative, is necessary for our purpose, nor can it be further postponed. Following William James, we turn to ethical considerations to incline the balance and enable us to decide.

It *may* be that voluntary and involuntary thinking are essentially the same; that we cannot, if we will, direct or even influence the stream of our thought; that our feeling of effort, when, as it seems to us, we overcome our tendency² to think of something interesting and attend instead to some unpleasant duty, is no more than a passing index of a conflict of interests.³ On the other hand, 'the whole feeling of reality, the whole sting and excitement of our voluntary life, depends on our sense that in it things are *really being decided* from one moment to another, and that it is not the dull rattling off of a chain that was forged innumerable ages ago. This appearance, which makes life and history tingle with such a tragic zest, *may* not be an illusion.'⁴

¹ Cf. W. James, *loc. cit.* Vol. I, p. 454.

² Corollary to third law: see above, p. III.

³ Cf. W. James, *loc. cit.* Vol. I, p. 451.

⁴ W. James, *loc. cit.* Vol. I, p. 453.

If the former theory—that I am not free to guide the stream of my thought and to direct the accompanying neural activity so as to produce desired movements—be correct, then we need make (or, rather, pretend to make) no further effort, whether to formulate laws of thought or to accomplish any other thing: all will happen as is fore-ordained. And, if we were to make the mistake of assuming the freedom of the psychic side of human nature—our souls and their agents, our wills—no harm would be done by our (imaginary) decision to accept the wrong theory; for our mistake, like everything else, would be inevitable. But if the second theory is right, if psycho-physical interaction is a reality and human souls are really free to influence neural activities and so to modify behaviour, the consequences of accepting and acting upon the opposite theory would be terrible in the extreme. Being born to freedom, we should live as slaves. There is therefore everything to lose and nothing to gain by deciding against the hypothesis of interaction, unless and until we are forced to do so by the facts. We shall therefore assume that soul and body interact¹ so that we are free to influence the direction of our thought.

¹ The manner of the interaction is discussed below. But it may help the reader if, subject to the more careful statements that follow, we note here that the assumed interaction of soul and body consists in the soul being acted upon by every neural activity that affects consciousness (and possibly by some neural activities that remain unconscious), while the soul acts upon the body and influences conduct only by 'willing', a process that includes the concentration of excitement in a limited system of neural arcs. It is because, on this view, it is only by 'willing' that the soul acts upon the body, and produces the observed behaviour, and not because the will is the only attribute of the soul, that we shall in the sequel have so much less to say about the soul than about the will. But see footnote 3 on p. 122 below.

§ 2. THE MODE OF INTERACTION

We have now to express this hypothesis more precisely. We wish, in fact, not merely to say that psychic activity interacts with, and may determine, neural activity, but to give as clear an account as possible of the manner of this interaction.

One possible way suggests itself at once. Suppose that my soul can act upon my body by increasing the excitement in any active system of higher level arcs. Then, by our third law, that system will drain excitement from all others. And, by our first law, the psychosis will correspond to the neurosis: as the excitement converges upon the chosen neurogram, the corresponding thought comes into the focus of consciousness. I am thus able to select any one of my thoughts and to concentrate upon it. In this way I can guide, or at least influence, my thinking. In so far as I can direct my thought I shall be able also to control such of my actions as are called voluntary.

We are going to assume that the soul can act upon the body in this way. We have now to inquire into the manner of this interaction. Our discussion will be helped if we use the word 'will' to describe that part or power of the soul that acts upon the body through the brain.

For the reasons given on p. 16 above we have made little use of the word 'mind'. But if we are asked what room is left for the mind when we assume direct action of soul on the body, the answer is that the mind is neither the soul nor the body but the meeting place of both.

The word 'will' is used in common speech with at least two different meanings. In the first place, we speak of the effort of will by which a man overcomes a temptation or

forces up the index of a dynamometer. And, secondly, we speak of the strength of will exhibited by one who, wearing down all opposition, keeps on and on until he has achieved his purpose. But the question how far I am able, by the exercise of my will, to give immediate effect to my present purpose is quite different from the question whether my motives are so persistent that, without changing my mind, I shall go on making one effort of will after another until I have attained my more remote object. We shall distinguish between the two senses in which the word 'will' is commonly employed by using the word 'Will'—written with a capital 'W'—only with the former meaning: Will at short range, as exercised in making a sudden voluntary effort. But will in the second sense, will at long range, we shall speak of, not as will, but as purpose.

The following quotations from William James and McDougall illustrate their opinion that the function of Will is to concentrate attention: that to will is the same as to attend or to reinforce excitement in some one active higher level neurogram so as to make it drain excitement from all the others.

William James describes willing either as 'attending' or as 'reinforcing'. He writes:

The faculty of voluntarily bringing back a wandering attention, over and over again, is the very root of judgment, character, and will. No one is *compos sui* if he have it not. An education which would improve this faculty would be the education *par excellence*.¹ . . . Attention with effort is all that any case of volition implies. *The essential achievement of the will, in short, when it is most 'voluntary', is to ATTEND to a difficult object and hold it fast before the mind.* The so-doing is

¹ *Loc. cit.* Vol. 1, p. 424.

the *fiat*¹. . . . To sum it all up in a word, *the terminus of the psychological process in volition, the point to which the will is directly applied, is always an idea*. There are at all times some ideas from which we shy away like frightened horses the moment we get a glimpse of their forbidding profile upon the threshold of our thought. *The only resistance which our will can possibly experience is the resistance which such an idea offers to being attended to at all*. To attend to it is the volitional act, and the only inward volitional act which we ever perform.² . . . The soul *presents* nothing herself; *creates* nothing; is at the mercy of the material forces for all *possibilities*; but amongst these possibilities she *selects*; and by reinforcing one and checking others, she figures not as an 'epiphenomenon', but as something from which the play gets moral support.³

McDougall also speaks of an act of Will both as a 'concentration of attention' and as a 'reinforcement':

It would seem, in fact, that the Will concentrates along one system of channels the free nervous energy of all the brain at the moment. . . . Voluntary attention to any object. . . is a reinforcement of the idea or percept, in virtue of which it is held more vividly and continuously in the focus of consciousness to the exclusion of other percepts and ideas.⁴

Again, Morton Prince regards the Will as operating by reinforcing the excitement of some particular neurogram. After pointing out the influence of a sentiment upon a sequence of involuntary thoughts, he adds: ' . . . volition itself

¹ *Loc. cit.* Vol. II, p. 561.

² *Loc. cit.* Vol. II, p. 567.

³ *Loc. cit.* Vol. II, p. 584. We notice the use of the word 'reinforcing'. Our quotation of this passage from William James does not mean that we accept his view of the soul as creating nothing and obtaining everything from material sources. On p. 117 we spoke of psychical and physical process as acting and reacting upon one another. The first cause may as well be psychical as physical. The soul may have a structure of its own that depends on the neurography no more than the neurography depends on the soul. But the action and reaction of soul and neurography tend to make them correspond.

⁴ *Physiological Psychology*, p. 165.

can control, reinforce, and determine the particular sentiment and thus govern conduct...'¹

Our assumption about the action of soul on body and the manner of it can now be formulated as our fourth law: *Will can reinforce the excitement in any active neurogram* which includes arcs of the higher level and the activity of which is already affecting consciousness. By our third law, that neurogram will drain the excitement from all other active arcs of the higher level. But the Will's reinforcement of the excitement in a neurogram must be sufficient to make it drain the excitement from other active arcs. It will then bring the corresponding thought into the focus of consciousness.² In this

¹ *Loc. cit.* p. 458.

² That the power to concentrate attention on any desired thought is the same as the power to reinforce excitement in the corresponding neurogram follows from our first and third laws of thought. Experimental support for this identification is not lacking. The reagents in Burt's experiments (*Brit. J. Psych.* Vol. III (1909-10), pp. 94-177) asserted that the dotting test required the greatest effort of attention. They concentrated their attention in order to be able to put a dot in each of the largest possible number of circles in a given time. The greater their effort of attention, the shorter must have been the latency—the interval between the stimulus (the appearance of the empty circle) and the reaction (the putting of a dot inside the circle). That effort of attention shortens 'reaction time' is, of course, well known: cf. W. James, *loc. cit.* Vol. I, p. 425, and pp. 427-34.

Now Sherrington has shown that, in the case of simple reflexes, short latencies follow strong stimuli. For example, the latency of the scratch reflex in a spinal dog usually lies between 0.14 second for intenser stimulation, and 0.5 second for weaker, but sometimes extends to 2.44 or even to 3.54 seconds. (*Loc. cit.* p. 21.) Similarly, the latency in the inhibition of extensor muscle, in the case of the flexion reflex, was as short as .032 second with strong stimuli; but with weak stimuli was occasionally as long as 0.4 second (p. 92).

There is no reason to doubt that the stronger the stimulus applied to the boy's motor centres in the dotting test, the shorter would be the latency of the reaction. It appears, then, likely that a strong feeling of effort of attention is accompanied by strong reinforcement of neural excitement in the motor centres.

way the Will may guide the stream of thought by concentrating excitement in selected active neurograms.¹

Our fourth law implies that the Will can deepen the stream of thought, as well as guide it. It is true that, when the Will intervenes to inhibit an emotion by concentrating attention on some conflicting thought, this intervention, if successful, may result in a decrease of the total excitement. But for most purposes of voluntary thinking, the Will reinforces the neural processes involved; as, for example, when McDougall found that the exercise of Will might so increase the intensity of neural impulses that ten or twelve readings of a row of nonsense syllables might effect a greater lowering of resistance—a higher degree of ‘canalisation’, or deepening of the neurogram for the whole series—than 150 readings ‘in an attitude of indifference’.²

We cannot say for certain whence comes the excitement added by the Will to that of an active neurogram in order to make it drain excitement from other active arcs. But introspection suggests that every act of Will excites the self-regarding sentiment.³ It is reasonable to suppose that the excitement added by the Will comes from this source. And the more fully developed a person’s self-regarding sentiment is, the more effective his act of Will is likely to be. Other

¹ By our third law and its corollary, interest-systems, especially if rich in instinct-neurograms, may also guide thought. So we may now say that a person’s thought is guided by his Will as well as by all his neurograms, or his neurography.

² McDougall adds this comment: ‘Experiments of this class...are bringing home to us the magnitude of the influence of conation (volition) as compared with mere temporal contiguity or succession. Mental process is effective...in proportion as it involves strong conation, strong desire or volition.’ (*American Journal of Insanity*, Vol. LXIX, p. 869.)

³ See above, p. 77.

things being equal, the man whose neurography is most systematically linked up with the neurogram of his self-regarding sentiment will seem to have the strongest Will. We recall McDougall's description of the Will as 'character in action'. He adds:

'Conscience' is moral character—character developed under moral guidance, character in which the moral sentiments are duly incorporated in the system of the sentiments, and, through the medium of the sentiment of self-regard, are given due weight in all moral issues.¹

We said that the Will not only concentrates excitement but also adds to it. The added excitement may not all come from the self-regarding sentiment. Some contribution may be made by interest-systems unconnected with this sentiment. For example, an effort of Will may include bodily movements. Some people make characteristic movements of this kind as part of every attempt to concentrate attention. The muscles of the lips, of the eyes, and of the forehead are most commonly involved. The position of strain, once voluntarily adopted, maintains itself, and the feeling of strain brings in a rush of impulses which add to the excitement available for stimulating whatever neurogram is to have its activity increased. The particular muscles affected vary widely with different persons. They are by no means always confined to the face and head:

It is a well-known fact that persons striving to keep their attention on a difficult subject will resort to movements of various unmeaning kinds, such as pacing the room, drumming with the fingers, playing with keys or watch-chain, scratching head, pulling moustache, vibrating foot, or what not, according to the individual. There is an anecdote of

¹ *Outline of Psychology*, p. 442.

Sir Walter Scott, when a boy, rising to the head of his class by cutting off from the jacket of the usual head boy a button which the latter was in the habit of twirling in his fingers during the lesson. The button gone, its owner's power of reciting also departed.¹

William James regarded these movements as serviceable in fostering thought by draining off superfluous brain currents. Dr Ballard is probably more correct when he writes: 'The real explanation, it seems to me, is that they support trains of thought by providing the necessary degree of present sense stimulation.'² He adds: 'I find that if I wish to concentrate my mind on a difficult problem I can do so best while rapidly tapping the ground with my right foot.' Many women find that they can better attend to a lecture when knitting. Sketching during a committee meeting often marks close attention rather than the reverse. And *The Daily Telegraph* of 10 December 1938 reports tests upon students the muscles of whose legs and arms came into action 'when they started thinking'. The students were asked to remember lines from Browning's poem 'The Ring and the Book', to add the numbers 4, 5, 6 and 7 in rotation to a given number, and so on. But 'when the question asked was very simple and needed practically no mental effort, such as "add 2 and 2", the muscles did not work.'

On the other hand, Spearman³ relates that any attempt on his part to master a mental problem of exceptional difficulty by means of such devices produces

not any solution, but solely a headache! For intensity he substitutes repetition; he looks at the problem with an

¹ W. James, *loc. cit.* Vol. I, pp. 457, 458.

² *Handwork as an Educational Medium*, 2nd ed. 1915, pp. 53, 54.

³ *Abilities of Man* (1927), pp. 334-5.

intentional *lack* of effort, and then soon puts it aside again; after this has been repeated often enough, the solution begins to emerge as gradually and with as little effort as do the outlines of an approaching ship. Now, on these two curious extremes of procedure being explained to a class of students, and on their being asked which of the two (if either) they themselves adopted, it appeared *that about half worked in the one way and half in the other.*

It may be that Spearman and half his students were thinking of a later stage in the process of solving an intellectual problem.¹ A period of effortful concentration will often usefully precede the effortless emergence of the solution.² The bodily movements described in the two preceding paragraphs accompany the conscious effort.

The excitement added by an effort of Will may also come in part from visceral or 'autonomic' arcs outside the self-regarding sentiment. Darwin, for example, testified to having heard, 'as a proof of the exciting nature of anger, that a man when excessively jaded will sometimes invent imaginary offences and put himself into a passion, unconsciously for the sake of reinvigorating himself; and', Darwin continues, 'since hearing this remark, I have occasionally recognized its full truth'.³ The added excitement that results from voluntarily putting oneself into a passion, or from over-exciting oneself by other voluntary means, may be further

¹ Spearman himself writes (*loc. cit.* p. 334): 'Conation produces its effect mainly by directing the mental energy to the relevant processes. When once this much has been achieved, the desired cognition ensues without effort.'

² See below, p. 250.

³ Quoted from Darwin (*The Expression of Emotions in Man and Animals*, p. 79) by Professor W. B. Cannon, *Bodily Changes in Pain, Hunger, Fear and Rage* (1915), p. 216.

intensified and prolonged by the bodily changes described above on p. 72.

In the third place, the effect of willing may be increased by voluntarily awakening interests in harmony with the act to be done. The awakening of these interests will not only add to the excitement but, by 'multiple stimulation' in the manner described above,¹ will involuntarily guide the stream of thought in the direction in which the Will is guiding it voluntarily, namely, towards the performance of the task. The wider and deeper the accessible interest-systems possessed by any individual, the greater the reserves of which his Will can thus make use to reinforce its direct action.²

Before leaving this discussion we do well to note one important effect of increasing neural excitement by voluntary effort. Since, according to our fourth law, the Will can only select and act upon neurograms that are already active, any increase in the excitement being diffused, according to our

¹ See above, pp. 98 and 103.

² The use to which such interest-systems as we are now considering may be put in voluntary thinking is illustrated in scientific research when the researcher desires to associate two hitherto unconnected thoughts or their corresponding neurograms. (Cf. below, Chapter 12.) For example, Maxwell, having formulated equations for the propagation of electro-magnetic waves, and conceiving the possibility of a hitherto unsuspected connexion between electro-magnetic waves and light, would, by voluntarily awakening his interest in optics, add to the excitement available for working out the speed at which, according to his equations, electro-magnetic waves would travel, a speed which turned out to be the speed of light. Or Newton, having conceived the possibility of a hitherto unsuspected connexion between the acceleration of a body falling on to the earth's surface and the central acceleration of the moon in her orbit, may have got from his interest in astronomy such an increase of neural excitement that, as in fact happened, he had to get a friend to complete the arithmetic which proved that the same terrestrial gravitation is responsible both for the weight of bodies on the earth's surface and for holding the moon in her orbit.

second law, may add to the number of neurograms from which the Will can choose one to drain the system. The greater the excitement, the more thoughts there are apt to be from which the Will can choose one to bring into the focus of consciousness. The greater therefore the neural excitement of a person at any time, the greater will be his chance of following a novel train of thought and so of doing original thinking;¹ or, if he is undergoing examination, the greater will be his chance of bringing to mind some almost forgotten element of his subject; or, if he is making a public speech, the greater will be the choice of language at his command.

§ 3. WILL IN EVERYDAY LIFE

It is only by using its power of Will that the soul or ego can intervene in the stream of thought and make itself felt. But the Will is by no means always on the stage.

We do but little at the direct instance of our Wills. Most of our movements are not willed at all. Of a spinal reflex one is not even conscious, and a sensation reflex or an instinctive movement may take place for the first time without being foreseen.² Reflexes and instinctive movements may

¹ Dr E. Webb (*Character and Intelligence*, Monograph Supplement to the *Brit. J. Psych.* 1915, Table VI) found that the correlation between measured *g* (perhaps the 'available excitement': see below, p. 148) of training college students and their estimated *originality of ideas* was 0.47. Cf. also W. James' observation that 'If *focalisation* [concentration] of brain activity be the fundamental fact of reasonable [voluntary] thought, we see why intense interest or concentrated passion makes us think so much more truly and profoundly'. (*Loc. cit.* Vol. II, pp. 366, 367.)

² Cf. W. James: 'The other day I was standing at a railroad station with a little child, when an express-train went thundering by. The child, who was near the edge of the platform, started, winked, had his breathing convulsed, turned pale, burst out crying, and ran frantically towards me and hid his face. I have no doubt that this youngster was almost as much astonished by his own behaviour as he was by the train, and more than I was, who stood by.' (*Loc. cit.* Vol. II, p. 487.)

not even be noticed; for, although any movement of skeletal muscles may affect consciousness, it may not receive attention. The neurogram of such a movement may not be sufficiently excited to make it drain excitement from the other active arcs; but if it does so, it will, for the future, be linked with the neurogram of the stimulus which led to the movement. The next time the stimulus neurogram is excited the excitement will tend to spread to the neurogram of the movement, which may thus be foreseen and brought under the Will's control; so that any movement of skeletal muscles that has already occurred and attracted sufficient attention, may thereafter be controlled by the Will. The Will can add to the excitement in the corresponding neurogram until the movement is repeated. But this general statement requires to be qualified unless the movement is so simple that a single performance leaves a sufficient record to render repetition possible: the man who has only once had the luck to cut a three on the ice, or to bring off a Telemark swing on skis, is not able to say that he can perform these feats at will. On the other hand, *'every representation of a [voluntary] movement awakens in some degree the actual movement which is its object;'¹ and awakens it in a maximum degree whenever it is not kept from so doing by an antagonistic representation present simultaneously to the mind'*.² Whenever movement follows at once upon the thought of it—i.e. when no antagonistic thought is present—we have what is called 'ideo-motor' action.³

¹ Thus the spectator of an exciting high-jump competition accompanies each competitors' jump with an incipient movement of his own legs. Other examples are quoted by W. James (*loc. cit.* Vol. II, p. 525) from Lotze.

² W. James (*loc. cit.* Vol. II, p. 526), who italicises the words quoted.

³ W. James (*loc. cit.* Vol. II, p. 522).

Now the voluntary movements which we have just been considering are called 'voluntary', not because the Will is needed to bring them about, but because they are subject to the Will's control. When they occur it is, as a rule, not because the Will has caused them. When they are inhibited, the Will is seldom to blame. These voluntary movements follow when their kinaesthetic images occupy unchallenged the focus of consciousness; and these images generally reach and hold that place at the end of such a train of involuntary thinking as we considered in connexion with our third law.¹

William James has pointed out how apt we are to suppose that the Will intervenes—that some *fiat* or effort of decision is required—in many voluntary movements which, in fact, are simple ideo-motor acts. Thus he writes:

We know what it is to get out of bed on a freezing morning in a room without a fire, and how the very vital principle within us protests against the ordeal. Probably most persons have lain on certain mornings for an hour at a time unable to brace themselves to the resolve. We think how late we shall be, how the duties of the day will suffer; we say, 'I *must* get up, this is ignominious', etc.; but still the warm couch feels too delicious, the cold outside too cruel, and resolution faints away and postpones itself again and again just as it seemed on the verge of bursting the resistance and passing over into the decisive act. Now how do we *ever* get up under such circumstances? If I may generalise from my own experience, we more often than not get up without any struggle or decision at all. We suddenly find that we *have* got up. A fortunate lapse of consciousness occurs; we forget both the warmth and the cold; we fall into some reverie connected with the day's life, in the course of which the idea flashes across us 'Hollo! I must lie here no longer'—an idea which

¹ See above, p. 104.

at that lucky instant awakens no contradictory or paralysing suggestions, and consequently produces immediately its appropriate motor effects. It was our acute consciousness of both the warmth and the cold during the period of struggle, which paralysed our activity then.... The moment these inhibitory ideas ceased, the original idea exerted its effects.¹

William James concludes that

the immense majority of human decisions are decisions without effort. In comparatively few of them, in most people, does effort accompany the final act. We are, I think, misled into supposing that effort is more frequent than it is, by the fact that *during deliberation* we so often have a feeling of how great an effort it would take to make a decision *now*. Later, after the decision has made itself with ease, we recollect this and erroneously suppose the effort also to have been made then.²... It may be remarked in passing, that the inhibition of a movement no more involves an express effort or command than its execution does.³

When we come to discuss the fifth law of thought we shall find that action of one kind or another is the natural end of every train of thought. We have already seen that an effort of Will seldom accompanies the final action. Introspection tells us that most of our trains of thought are even more free from efforts of Will than the acts which end them. Or, as we said, most of our thinking is involuntary, guided by sensations, instincts, and active or inactive interest-systems in the manner as described⁴ in our last chapter.

Among these involuntary thought-activities the soul only intervenes, by means of the Will, in the event of conflict between the involuntary processes. Such conflicts tend to

¹ W. James, *loc. cit.* Vol. II, pp. 524, 525.

² *Loc. cit.* Vol. II, pp. 534, 535.

⁴ See above, pp. 112 *et seq.*

³ *Loc. cit.* Vol. II, p. 527.

prevent the fulfilment of the soul's purposes. The Will, in fact, only intervenes to resolve conflicts.

Introspection is our authority for this generalisation. I am only conscious of an effort of Will when my involuntary thoughts have conflicting tendencies. Our generalisation accords with an observation of William James on that part of an involuntary train of thought which is most open to examination: namely, the final act. After multiplying examples of ideo-motor action, which show how the final act of a train of thought ordinarily takes place without an effort of Will, he reaches the conclusion we have quoted¹ that the presence in consciousness of an image of a movement brings about the actual movement whenever the image 'is not kept from so doing by an antagonistic representation present simultaneously to the mind'. And he adds: 'the express fiat, or act of mental consent to the movement, comes in when the neutralisation of the antagonistic and inhibitory idea is required.'² In fact, according to William James, the Will intervenes at the exposed end of a train of thought only when there is conflict between the involuntary processes at work.

There is no reason to suppose that the Will intervenes at any other point of an involuntary train of thought except for the same reason: namely, to resolve a conflict. But for this reason the Will generally does intervene. According to Hart, resort to the Will, the 'subjective appreciation of the forces at war within us, and deliberate adoption of a consciously selected line of conduct may be regarded as the rational or ideal solution of a conflict. In fact it may be said to provide the only possible solution in the strict sense of the

¹ On p. 130 above.

² *Loc. cit.* Vol. II, p. 526.

word.'¹ The conflict of which Hart is here writing is due to the existence of an interest-system²—or, at least, a complex³—whose influence upon the direction of the nervous impulses is antagonistic to that of the other interest-systems and neurograms that make up the total neurography of the brain. In Chapter 9, below, we shall see how the Will may either remove these antagonisms, or else resolve the conflict by some other means.

¹ *Loc. cit.* p. 79. Cf. also J. C. Fluegel, *Brit. J. Psych.* Vol. VIII (1917), p. 489.

² Above, p. 81.

³ Above, p. 81.

CHAPTER 7

THE ANALYSIS OF ABILITY

§1. THE SINGLE GENERAL FACTOR AND SOME GROUP-FACTORS

A POWER to add to the excitement of any active neurogram which includes higher level arcs, and so to concentrate attention upon any of one's thoughts at any moment, could make itself felt in every intellectual process. We have assumed that the soul has this unique power and have identified it with the Will. If our hypothesis is well founded, this power of a person's Will must operate every time he tries to pay attention. It must be a common factor in every act that requires an effort of attention on his part. But is there any experimental evidence of a single general factor at work whenever the performance of one and the same person is measured by any sort of test that requires intellectual effort on his part? There is indeed; and its discovery by Professor Charles Spearman is one of the most remarkable feats of modern psychology.

Many factors, called faculties, were formerly supposed to enter into the make-up of each individual person. It was assumed that 'whatever is true of any one performance is necessarily also true of all other performances usually bearing the same name, such as "apprehension", "discrimination", "judgment", etc.; it was the old theory—so easy to scotch, but hard to kill—of "faculties". This fallacy, though long

banished from open daylight, still strangely persists in dark corners.’¹

For example, it was once usual to speak of a ‘faculty of observation’; and it was implied that an increased capacity for observing any one class of objects (say, millinery) must be due to the development of this faculty, and that therefore a capacity for observing any other class of objects (buildings, let us suppose) must necessarily be improved at the same time. No evidence has, however, been forthcoming that whoever can bring back from a walk down Bond Street the most accurate description of the hats in the shop-windows will, on the average, also bring back the best account of the architecture of the shops. On the contrary, the milliner, just because she gives her attention to the hats, is precluded from observing the buildings; while the architect, whose attention is attracted to the buildings, fails to notice the hats. In short, training persons to observe hats does not result in their observing buildings. There is no general faculty of observation that may be developed by practice on one kind of material and be afterwards employed on quite another. And so with other supposed faculties. ‘The balance of expert opinion is now so solidly against the general dogma of formal [faculty] training that as an educational force it must be regarded as moribund.’²

While, however, the old theory of faculties has fallen upon evil days, Spearman and his followers have shown that a single general factor, *g*, characteristic of the person tested,

¹ B. Hart and C. Spearman, *Brit. J. Psych.* Vol. v (1913), p. 64. See also Professor Cyril Burt’s *Historical Note on Faculty Psychology* printed as Appendix IV at p. 429 of the *Spens Report* (1938).

² J. Adams, *The Evolution of Educational Theory*, p. 222 (quoted on p. 29 above).

enters into the measure of his performance in every test requiring intellectual effort.¹ If the tests of his abilities are sufficiently different from one another, g will be the only common factor in the measures of his performance in each test. But if the series of tests includes a group of tests that resemble one another, his performances in the tests belonging to this group will have in common a 'group factor' as well as the single general factor, g . Such group factors are independent of each other and of g . They have been shown to occur in tests that involve the use of words,² or the perception of space,³ or when the tests consist of examination results in diverse subjects,⁴ or when fluency or quickness⁵ enter into the performance.

Spearman's first paper on this subject was published in 1904. He then suggested that '*all branches of intellectual activity have in common one fundamental function (or group of functions)*';⁶ and that this fundamental function enters into sensory discrimination as well as into more complex intellectual activities. Spearman himself and a host of other

¹ The Spens Report: '*Intellectual development during childhood appears to progress as if it were governed by a single central factor, usually known as "general intelligence", which may be broadly described as innate all-round intellectual ability. It appears to enter into everything which the child attempts to think, or say, or do*' (p. 123).

² Dr William Stephenson's verbal factor, v . See papers in the *Journal of Educational Pedagogy* for 1931, beginning on p. 167.

³ A. A. El Koussey's space factor, K (*Brit. J. Psych. Mon. Sup.* 20), identified by E. S. S. Price with W. P. Alexander's 'practical factor' (*Brit. J. Psych. Mon. Sup.* 19, p. 123).

⁴ The group factor here is Dr E. Webb's w (*Brit. J. Psych. Mon. Sup.* of 1915). See Alexander, *loc. cit.* p. 125.

⁵ The group factor this time is Garnett's c (*Brit. J. Psych.* 1919, pp. 349-359 and *Proc. R. S. (A)*, Vol. 96, 1919) and H. L. Hargreaves (*Brit. J. Psych. Mon. Sup.* 10, 1927). See R. B. Cattell (*Brit. J. Psych.* Vol. xxiii, 1932-3, and Vol. xxiv, 1933-4), for the reasons for identifying c with F .

⁶ *Am. J. Psych.* Vol. xv (1904), p. 284.

workers in this field have collected a great mass of evidence that 'all performances depend in a certain degree upon one and the same *general factor*'.¹ In his latest book,² Spearman describes this work as

an attempt... to furnish psychology with a new foundation. To its bases of faculties, analysis, and laws has been added that of 'factors'; in particular that of the factor called *g*... An instance of the scientific results already in course of being achieved by *g* is its usage to supplant all current determinations of 'mental age' or 'general intelligence'.

But since the publication of Spearman's earlier work on *The Abilities of Man*³ (1927) there has been little room for doubt that a single general factor enters into all mental qualities, or that it is the only factor common to sufficiently different qualities of the same person; and, as Dr Irwin and the present writer have shown, this common factor is unique.⁴

In order to obtain further insight into the nature and working of 'factors' in mental tests, let us suppose that I am undergoing a series of mental tests and that my performance in one of them is measured by *q*. Then *q* may be regarded as made up of certain proportions of the degrees in which I

¹ Hart and Spearman, *Brit. J. Psych.* Vol. v (1912-13), p. 52.

² *Psychology Down the Ages* (1937), Vol. II, p. 240.

³ See, especially, Chapter 10.

⁴ Irwin writes: 'as the number of tests [of sufficiently dissimilar mental qualities of one and the same person] is increased indefinitely there is a vanishing degree of probability that the indeterminacy in any person's *g* estimate will exceed any positive quantity however small.' (*Brit. J. Psych.* Vol. xxv (1935), p. 394.)

Doubts about the uniqueness of *g* were, however, raised by E. B. Wilson (*Proc. Nat. Acad. Sci.* Vol. xiv (1928), p. 283 and *J. Educ. Psych.* Vol. xx (1929), p. 217). Wilson was answered by J. O. Irwin (*Brit. J. Psych.* Vol. xxii (1932), p. 359) and by the present writer (*Brit. J. Psych.* Vol. xxv (1934), p. 103). See also H. T. H. Piaggio (*Brit. J. Psych.* Vol. xxiv (1933), p. 88).

possess the single general factor g , some group factors, and a residual 'specific' factor peculiar to this test. If all these factors, other than g ,¹ are so chosen as to be independent of each other and of g , the measure of any one else's performance in the same test will be made up in precisely the same proportions of the degrees in which this other person possesses these same factors.²

¹ g chooses itself: see the next footnote.

² In the language of algebra,

$$q = r_g g + (r_a a + r_b b + \dots) + r_s s. \quad \dots (1)$$

Here g ; a , b , ...; and s measure the degrees in which the person tested possesses the single general factor, the group factors and the specific factor respectively. The r 's are the same for each person tested. They measure the 'correlation' between the particular quality tested and the independent factors. Indeed, as was shown by the present writer in 1919 (Garnett, *Proc. R. S. (A)*, Vol. xcvi, pp. 91 *et seq.*), the quality measured by q may be thought of as a vector having direction-cosines, measured by the r 's, with the orthogonal axes along which g , the group factors and the specific factor are all measured. Spearman describes the investigation of group factors as having begun with this conception. He refers to the present writer's use of 'trigonometry and the rotation of axes' in order to extend 'the scope of determination from one to two common factors'; and he adds 'in itself this method has not had much subsequent usage, but in principle it seems to have more or less inspired all later work'. (*Psychology Down the Ages*, Vol. II, p. 278.)

It remains to add that $\sum r^2 = 1$ (i.e. $r_g^2 + r_a^2 + r_b^2 + \dots + r_s^2 = 1$); and that, if a very large number of sufficiently different qualities (i.e. a very large number of different q 's with no appreciable group factors) all belonging to the same person are measured, then the most probable value of that person's general factor is:

$$g = \frac{\sum \frac{qr_g}{1 - r_g^2}}{1 + \sum \frac{r_g^2}{1 - r_g^2}},$$

a result first given by the present writer in 1930 (see *Brit. J. Psych.* Vol. xxii (1932), p. 368). See also Spearman (*J. Educ. Psych.* (1934), p. 142); Irwin (*Brit. J. Psych.* Vol. xxv (1935), p. 393); and Piaggio (*ib.* p. 488).

The proportions in which g and certain group factors enter into different qualities or different kinds of achievement is illustrated in a recent research by Mr W. P. Alexander.¹

Among other groups tested by him were 103 boys, pupils in a Chicago 'technical high school'. All the boys were American-born whites. The parents were of various nationalities, but all of them spoke English and all had been at least fifteen years in U.S.A. All the parents were American citizens. The boys had all been trained in technical subjects, including shopwork, mechanical drawing, mathematics and science. Their ages ranged from 14 years 1 month to 19 years 7 months at the time of the tests.

These boys were tested in twenty different ways. First came five tests of school achievement in Shop Work (Engineering, etc.), Mechanical Drawing, Mathematics, Science and English. 'They are the results of several successive examinations in the respective subjects.' Then came four verbal tests such as are commonly used for the measurement of intelligence. Next, two 'number-verbal' tests. After that, six tests involving ability to understand or handle objects in three-dimensional space. And, finally, three of Spearman's tests for the measurement of g .

It was found that each boy's performance in each of these twenty tests was made up of certain proportions of g and of four group factors ν , $[w]$,¹ $[K]$,¹ z . These proportions² are shown in the first five columns of figures in Table I below. The sum of the squares of the figures in each column is given at the foot of the column in the last row of the table. It is marked Σk^2 .

¹ *Brit. J. Psych. Mon. Sup.* 19 (1935). See next footnote but one.

² The r 's in equation (1) of the footnote to p. 139 above.

TABLE I¹

Test	g	ν	$[w]$	$[K]$	z
[School Achievement]:					
Shop Work	.243	.011	.503	.278	.447
Mechanical Drawing	.358	.173	.766	.179	.000
Mathematics	.452	.351	.563	-.020	.118
Science	.292	.477	.633	.051	.095
English	.259	.656	.394	-.082	.152
Verbal test 1	.402	.822	-.065	.122	.095
Verbal test 2	.431	.779	-.124	.128	-.063
Verbal test 3	.673	.548	-.055	.128	.114
Verbal test 4	.585	.646	.000	.000	.000
Number-Verbal test 1	.730	.276	.098	-.060	.219
Number-Verbal test 2	.759	.153	.065	-.026	.232
[Space Appreciation]:					
Cox test E3	.558	.211	-.029	.398	.000
Cox test C	.496	.164	-.205	.408	-.032
Cox test D	.493	.091	.060	.277	-.063
Passalong test	.393	.135	.030	.281	-.235
Kohs' Block test	.564	-.003	-.004	.339	-.401
Cube Construction test	.221	.141	.000	.704	.000
Spearman test 1	.632	-.138	.043	-.027	-.219
Spearman test 2	.512	-.076	.098	.050	-.354
Spearman test 3	.692	.000	.000	.000	.000
Σk^2	5.256	3.053	1.809	1.266	0.768

¹ Alexander uses the third Spearman test 'as a criterion of g '. The vector measured in this test is then taken as the axis of g for the purpose of expressing the measure, q , of each quality tested in the form

$$q = r_g g + r_\nu \nu + r_w w + r_K K + r_z z + r_s s, \quad \dots (2)$$

where the first five r 's are the figures in the five columns of Table I (compare equation 11 on p. 361 of the present writer's paper on General Ability, Cleverness and Purpose, *Brit. J. Psych.* Vol. ix (1919)). Then, as in the paper just cited, the next axis, this time of ν , is chosen 'so that it is at right angles to the g axis' (Alexander, p. 109). The 'definition of ν must be "that factor which operates in verbal tests independent of and in addition to g ". ν is therefore the residual factor in verbal tests when g

Inspection of this table shows that every one of the twenty qualities tested contains a considerable proportion of *g*, the proportions being the figures in the first column; and, as Alexander points out, '*g* is definitely the most important factor for the total situation, though not always the most important factor in a particular test'.¹ The tests thus confirm the existence of *g* as a *general factor*. And since none of the other factors *v*, *w*, *K* or *z* enters to a significant extent into anything like all the qualities, *g* makes good its claim to be the *single general factor*.

Next in importance to *g*, in the series as a whole, comes Stephenson's verbal factor, *v*. No student of Head's work on *Aphasia* will be surprised by this further evidence of the large part played by words in our thinking.

But in the 'school achievement' group of tests as a whole, *w* is much more important than either *g* or *v*, although *v* outweighs *w* in the test of achievement in English. Now *w* is the factor of which Alexander wrote that it 'may have some relation to Webb's character factor "*w*", which measures, more or less, what is generally called *reliability*'. Webb himself described his factor as having some close

is taken out' (Alexander, p. 95). Alexander then chooses his third axis, that of *K* (he called it *F*, but his *F* is not the same as Hargreaves' *F* or Garnett's *c*: following Price, it is here identified with El Koussey's 'space' factor *K*), to be at right angles to *g* and *v* and to account for most of the correlation left between the 'space' tests when the effects of *g* and *v* have been taken out by the method of partial correlations. Alexander adds: 'We know that we have two factors left and we find... that these are essentially peculiar to the school achievement tests. We have to define a fourth axis [that of *w*, which Alexander calls *X*] orthogonal to the first three and we have decided to locate it in the residual in the technical achievement group of tests' (p. III). The Table is taken from p. III of Alexander's paper.

¹ *Loc. cit.* p. III.

relation to 'persistence of motives'. 'This conception', he adds, 'may be understood to mean *consistency of action resulting from deliberate volition, or will.*'¹

The group factor K is of great importance in the group of tests of space appreciation, and also of considerable significance in Shop Work and Mechanical Drawing. Alexander regarded this factor as a measure of practical ability. Its distinctive quality, defined to be independent of g and of ν , would however seem to be the same as that of El Koussey's 'space' factor, K .²

The last group factor, z , belongs to no one group. It may be related to Hargreaves' F or Garnett's c . Alexander ventures no further than to say that it may be 'a second factor in character', like F or c . 'We are loath to give it a name, lest we name it wrongly.'³ We shall imitate his caution.

Before leaving Alexander's figures, to which we shall return later, we do well to notice his clear understanding of the need for defining each new group factor so as to make it independent of g and of other group factors previously defined. This is essential if analysis by factors—the method of vector analysis—is to result in an intelligible and unequivocal map of the qualities of men's minds. A paper⁴ by the present writer pointed this out as long ago as 1919; and Professor Thurstone's recent book on *The Vectors of Mind*⁵ has made

¹ Webb, *Brit. J. Psych. Mon. Sup.* 3, p. 60. But as Webb defined his factor, it had some g in it. We have here defined it so as to be independent of g , of ν , and of the space factor K .

² See above, p. 137. The fact that K does not enter into Mathematics in these tests may be due to the study of Mathematics by these boys, including no geometry of more than two dimensions. And their Science, as Alexander says, may have been 'verbal or abstract' (p. 131).

³ *Loc. cit.* p. 128.

⁴ *Brit. J. Psych.* Vol. IX (1919), pp. 345–66.

⁵ Chicago, 1935.

it abundantly plain. Yet the fact has not yet been grasped by many writers who would demonstrate the existence of further group factors without proving that they contain anything new.¹

§ 2. THE NATURE OF THE FACTORS

So far, all is plain sailing enough. 'The trouble is not so much in proving the existence of the General Factor as in revealing its precise nature.'² The same is true of the group factors.

Now we have already³ observed that power to add to the excitement of neurograms which include higher level arcs, and so to concentrate attention on the corresponding thought, would constitute a general factor.

One of the earliest investigations in this field was undertaken by Professor Burt in 1909.⁴ He made experiments on two groups of Oxford schoolboys with a view to testing in practice the mathematical methods of Spearman. Burt found that the greater the ability of the boys he tested to concentrate on some new thing, the greater also was the measure of their general factor, g . This was not a question of their zeal or goodwill. Their g was great when they possessed great ability to concentrate on something to which they desired to attend. After reviewing all his evidence on the nature of the general factor g , Burt wrote:

We have seen throughout that the greater the change, and the greater the complexity, and the greater the novelty

¹ I.e. that their vectors do not lie wholly in the multi-dimensional space defined by g and recognised group factors that are independent of each other and of g .

² Hart and Spearman, *Brit. J. Psych.* Vol. v, p. 65.

³ See above, p. 135.

⁴ *Brit. J. Psych.* Vol. III (1909-10), pp. 94-147.

involved in the task performed, the greater also (*ceteris paribus*) is the Imputed Intelligence of the performer. To relative novelty all the other attributes are probably secondary. Thus high intelligence seems to mean high capacity for continually systematising mental behaviour by forming new psycho-physical co-ordinations, older co-ordinations being retained, so that newer co-ordinations bring with them increased complexity and incessant change. In such progressively integrative actions of the mind the efficient and directive agent is attentive consciousness. And in this sense we may agree that so-called 'Voluntary' Attention is, of all recognised psychological processes, the essential factor in General Intelligence.¹

Burt's conclusion that 'voluntary' attention is the essential factor in 'general intelligence' brings him into line with Binet, who believed the central factor to be 'voluntary' attention,² and with Wundt, who 'would make attention the very essence of intellectual power'.³

Spearman, on the other hand, is unwilling to accept the view that *g* measures attention unless attention is defined as 'the application of intellectual energy'; but he adds: 'now at last the view that *g* measures attention enters into excellent agreement with every fact so far encountered by us.'⁴ McDougall would apparently accept this definition of attention.⁵ But Professor A. V. Hill objects to the term 'energy' being used to explain mental phenomena.⁶ Indeed,

¹ *Loc. cit.* p. 169.

² Cf. W. Brown, *Mental Measurement* (1911), p. 89, and C. Burt, *J. Educ. Psych.* Vol. 1 (1911), p. 93.

³ Spearman, *Am. J. Psych.* Vol. xv (1904), p. 208.

⁴ *Abilities of Man*, p. 344.

⁵ Physiological concentration of attention seems to involve concentration of the disposable energy of the brain in one system of channels (*Outline of Psychology*, p. 278).

⁶ *Chemical Wave Transmission in Nerve* (1932).

there is no evidence that the 'mental energy' or intellectual energy of Spearman, or as McDougall calls it 'disposable free energy of the brain', has any existence. Certainly it is not the 'energy' of physics.

While, however, McDougall is one of those who regards conation or effort as belonging to the essence of attention, Spearman reminds us that the relations between performances in different mental tests may be the same whether the tests are done with great or with little effort.¹ This observation is based upon an experiment in which one half of the children tested were told to work as hard as they possibly could, while the other half were told not to work particularly hard. But, in this case, all or none of the children in each group made the effort. That the result might have been very different if in one of the tests some of the children had been working as hard as they could while others were making little effort, is indicated by another experiment recorded by Spearman. In this series of mental tests the performances of one of the officers at the British Naval Staff College bore no relation to the estimates of his intelligence formed by eight instructors. It turned out that on the day of the testing this officer had received calamitous news from home.²

Now each of the usual mental tests is finished in a few minutes. Such tests, as distinguished from those that measure school achievement by 'the results of several successive examinations in the respective subjects',³ commonly begin with an instruction to do or say something that constitutes the response to be tested. This instruction, or 'signal', creates an incoming sense impression for each person being tested.

¹ *Abilities of Man*, p. 333.

² *Abilities of Man*, p. 338.

³ Alexander, *loc. cit.* p. 105.

The sense impression excites the first of a series of neurograms which will all be excited in turn as the response proceeds. But the magnitude of the response, or the candidate's mark in the test, is certainly not proportional to the stimulus from the sense impression. The loudness of the examiner's voice, or the illumination of the test-paper, would not determine the response unless it were merely reflex or habitual. Indeed, there is no more connexion between the magnitudes of the signal and of the response than there is between the loudness of my ring at a neighbour's bell and the size of the person who answers the door.

If, then, the amount of excitement that leads to the response in the usual quick test does not depend on the magnitude of the outside stimulus, what does it depend on? Why not on the candidate's *g*, the only common factor in all the tests applied to him?

We may suppose that my neurogram of myself, including my self-regarding sentiment with all its powerful affects, is always active during my waking moments; that the excitement directly due to an incoming sense impression, such as the instruction for a mental test, will then be drained¹ by my self-neurogram, unless some other (due perhaps to bad news from home² as in the case of Spearman's naval officer) is more active at the moment; that a circular nervous process,³ such as was described on p. 70 above, is then set going and results in the re-stimulation of the signal neurogram which had been directly excited by the stimulus from outside. Then it will be the amount of excitement due to this re-

¹ See our third law on p. 104 above.

² Cf. above, p. 146.

³ Due to the working of the instincts involved in the system of my self-regarding sentiment.

stimulation, an amount depending on a permanent quality of myself, that determines, *inter alia*, the measure of my response and the intensity of all my thought leading up to it. It may well be that g measures the excitement always on tap in this way. Then g corresponds to the size of the person who answers the door when the bell is rung, the same person however loud or soft the ring unless it be too soft to be heard.

If we may thus think of the single general factor, g , what will be the nature of the group factors? According to the character of the test, or other sudden demand made on me, the excitement due to g may have to spread through one chain of neurograms or another. The test may require a verbal response, or a response that can only be made after a train of verbal thought. The response will then depend upon the innate and acquired qualities of the manifold regions¹ of my brain involved in the use of words, whether for thinking or expression. The resistance offered to the passage of excitement through that part of my brain will depend on the innate qualities (nature) of that region and on how frequently it is used (nurture, including my knowledge of the matters in question). These qualities, whether innate or acquired as neurograms, may account for Stephenson's verbal factor v . Or, if the test concerns not words but things, and involves appreciation of relations in space, my response will depend upon the innate qualities and acquired neurograms in other parts of my brain; and these may manifest themselves in Alexander's 'practical ability' or El Koussey's space factor, K . And so with other independent group factors of this kind.

Our analogy of the ring at the front door bell will again help us here. The person who answers the door may be sent

¹ See Head, *Aphasia*.

on an errand in one direction or another, according to the nature of the test. He may have an easy journey through open porticoes and sunlit salons in the inhabited part of the house, such as the ν part of the brain of a poet; or he may have to make his difficult way through barred and bolted doors and dirty passages to another part that is seldom visited, such as the K part of the brain of an unpractical man.¹

But there are other group factors of a different kind. They may not show themselves in the usual quick test.² When, however, the test is extended to measure school achievement over a period of years, these other group factors may count for more than any of the others, or even than g itself.³ Such a group factor is Webb's w , defined (as we have defined it) to be independent of g . It measures persistence of motives or purposefulness. We shall call it the purpose-factor. Alexander's Table (Table I on p. 141 above) showed how it played the largest part in school achievement, except only in English, where ν was dominant. The dominance of w need not surprise us, since school achievement depends much less on a lively response to an external stimulus than on 'bringing back a wandering attention over and over again', the capacity described by William James as the 'very root of judgment, character, and will'. This capacity, measured by w , may be partly innate, depending on the structure of the instinct neurograms to which, as explained in the next chapter, my purposes are linked. But w is also due to nurture:⁴

¹ Since ν and K are independent the poet may also be a practical man with a strong 'space' sense.

² Cf. Binet and Simon, *Année Psychologique*, 1900, p. 77.

³ See above, p. 142.

⁴ Thus the *Spens Report* speaks of 'young men and women...trained to concentrate their attention' (p. 169).

it depends partly on my purposes and their neurograms formed by my education and my Will: a purpose, for example, to achieve all I can at school. On this view, while g measures my power to concentrate attention¹ when I wish to do so, w is the measure of the influence of my purposes on my use of this power.

We are not, however, to suppose that these pictures of g , v , K and w as psychological realities represent final and absolute truth. They are useful only so long as they suggest experiments and calculations that enable us to explain and predict thought and action. We must be ready to discard one picture and adopt another as often as expediency or convenience demands. On the other hand, we cannot afford to do without psychological or physiological concepts in our analysis of mind. Mathematical technique is no substitute for psychological insight.²

§ 3. WILL AND PURPOSE IN EDUCATION

There is no experimental evidence that g is altered by education. Further research is needed to decide the issue. It would be interesting, for example, to discover whether men of strong character and good education are better able than their opposites to avoid showing signs of sudden physical pain.

Meanwhile it is safe to assume that the purpose-factor w can be increased by education. Determination to achieve success in school is notoriously subject to the influence of environment. A stimulating talk with one's new form master,

¹ Cf. The *Spens Report*: 'The development of attention seems to depend mainly on the development of "general intelligence"' (p. 126).

² Cf. Jeans on Maxwell's method (*James Clerk Maxwell*, pp. 97-99).

or failure to get moved up from a form where one marks time and becomes bored, may make all the difference. And, as we shall see in the next chapter, every time one's purpose-neurograms, whether to succeed in school or to attain any other goal, are excited they are deepened and rendered more able to influence future thought and conduct.

At all events there is very general agreement that ability to bring back a wandering attention over and over again can be increased by practice. Such ability would, like Webb's purpose-factor as he defined it and like the school achievements of Alexander's boys,¹ depend partly on *g* but mainly on *w*. Except in quick tests, success demands both the power and the purpose to concentrate attention. For example, the Archbishop of York writes: 'It scarcely matters what subject is taught: the vital matter is that the child should learn "attention" in general.'² Again, 'care must be taken so that at every stage the children have work to do, something to bite at that is difficult but just not too difficult for them'.³

The study of classics in English Public Schools is justified on the ground that 'it is easier beyond all question to make a form of thirty boys to think hard over a Latin Prose than any other subject'.⁴ Mr Robinson speaks for many public schoolmasters, when he adds that 'up to the ages of sixteen or seventeen, the time will be spent most profitably in training a boy to think'.⁵ McDougall takes the same view: 'it is probable that the principal effect of the old-fashioned

¹ See above, p. 137.

² *The Nature of Personality*, p. 28.

³ *The New Teaching*, p. 262. (Article by James Fairgrieve on Geography.)

⁴ C. E. Robinson of Winchester in *The Nineteenth Century and After* (June, 1917), p. 1324.

⁵ *Loc. cit.* p. 1326.

education, which aimed at "training the faculties", by drilling in Latin Grammar and other similar subjects, was the development of this power of voluntary concentration¹ of attention on things in which we have only a derived interest."²

Again, Sir Edmund Gosse describes how, as a child, he spent many hours in a stuffy room making solemn and ridiculous imitations of papers read by his father before the Linnean Society; and he adds:

My labours failed to make me a zoologist, and the multitude of my designs and my descriptions have left me helplessly ignorant of the anatomy of a sea-anemone. Yet I cannot look upon the mental discipline as useless. It taught me to concentrate³ my attention.... Moreover, it gave me the habit of going on with any piece of work I had in hand, not flagging because the interest or picturesqueness of the theme had declined, but pushing forth towards a definite goal, well foreseen and limited beforehand. For almost any intellectual employment in later life, it seems to me that this discipline was valuable. I am, however, not the less conscious how ludicrous was the mode in which, in my tenth year, I obtained it.⁴

Once more, C. G. J. Jacobi (1804-51), the great mathematician, is reported to have said: 'It must not be supposed that it is to a gift of Nature that I owe such mathematical power as I possess. No, it has come by hard work, hard work. Not mere industry, but brain-splitting thinking—hard

¹ I.e. bring it back again and again to a distasteful theme. The word 'concentrate' here is shown by the context to mean something different from the alert response to a quick test. It seems to mean *w* as well as *g*.

² *Outline of Psychology*, p. 279.

³ See first footnote above.

⁴ *Father and Son* (1909 edition), p. 176.

work; hard work that has often endangered my health.’¹ Jacobi’s statement that his mathematical power was due to hard work accords with Alexander’s results shown in the table on p. 141 above. Alexander’s boys owed their mathematical achievement rather to w than to g ; and we have seen reason to believe that, whether or not the magnitude of g be wholly due to heredity, w can be increased by hard work.

¹ Professor Sir Richard Gregory, *Discovery*, p. 5. Sir Stanley Leathes, when chief Civil Service Commissioner, was of the same opinion: ‘What is valuable in historical education,’ he wrote, ‘is not the acquisition of a set of facts . . . by lectures or systematic instruction, but . . . the *effort* to master and understand the books that we were set to read.’ (*What is Education?* (1913), p. 82. Italics mine.)

CHAPTER 8

PURPOSE

§ 1. PURPOSE-NEUROGRAMS

PEOPLE differ from one another in the amount of attention they give to the future. Some discount it at a high rate, some at a low. Those politicians who do not look beyond the next election are among the former. Clergymen, schoolmasters, and the greater statesmen belong to the latter class: they work with distant objects in view. But all of us in some degree make plans for the future. These plans are the soul's purposes.¹

Each of my present purposes, however far ahead its fulfilment may lie, is represented by one of my neurograms. Connected with it is my neurogram of a signal, the arrival of a certain time or the occurrence of a certain event. The signal, when it comes, excites its neurogram and the excitement is likely to spread to that of the purpose, which thus tends to be realised. If we speak of all the neurograms connected to my neurogram for future time as forming my 'future' interest-system, we can say that each of my purposes has its neurogram belonging to my 'future' interest-system.²

It is true that the neurography of every young person contains neurograms which may some day be excited through the appropriate signal-neurogram, when (as in the case of the child whom William James saw frightened by a railway

¹ See above, p. 133.

² See below, p. 157.

train¹) his unforeseen conduct will cause him surprise. But such conduct is both unintentional and unforeseen. It can hardly be described as belonging to his purposes. The same is true of actions performed under the influence of hypnotic suggestion without being foreseen by the hypnotised subject.

We shall restrict our use of the term 'purposes' to describe conscious purposes, purposes that have at some time or other occupied the focus of consciousness. We might go further and refuse to recognise as 'purposes' any that were not willed. We should then confine the term to purposes which the Will helped to form. But if we reflect upon the origin of the purposes we hold most dear, we shall find that few of them are directly due to acts of Will. When the twelve-year-old son of a Cambridge graduate says that he will, in due course, proceed to his father's university, his purpose may be definite enough but is not necessarily due to his Will. To follow in his father's steps may well present itself to him as the only right and proper thing to do. He approves the purpose, but does not will it. What this approval involves we are about to discuss. Meanwhile we observe that the approved purpose to follow his father to Cambridge is no less a conscious purpose, as we have defined it, than is a willed purpose to learn to swim next summer or to pass an examination this term.

Purposes, whether willed or merely approved, may be divided into two groups. To the first belong positive purposes: to do, or to think of, something. The other group consists of negative purposes: to abstain from doing, or thinking, something. What is the difference between the neurograms of these two kinds of purposes?

¹ See footnote 2 on p. 129 above.

When a hypnotised person is told by the hypnotist to do so-and-so at such-and-such a future time and, having recovered from the hypnotic trance, acts at the appointed time as the hypnotist has suggested without being aware of it, the neurographic mechanism may be very simple. It need consist of no more than the neurogram of the signal and the neurogram of the deed so connected that when the signal occurs and its neurogram is excited, the excitement spreads to the neurogram of the act and so brings it about. This system of two neurograms is detached or dissociated from the systems of arcs excited by the main stream of thought.

The neurogram of a conscious purpose forms part of a more complex system. It must have drained the excitement from all other active neurograms on at least one occasion when the purpose occupied the focus of consciousness. In this way it must have become connected with all those neurograms. It may also have been re-excited in whole or in part as the purpose was, from time to time, remembered or thought about. On each of these occasions it will have acquired new connexions.

A certain difficulty may trouble us at this point. Suppose that my purpose is to go for a walk at three o'clock. The corresponding neurogram will have elements corresponding to myself, to a future time and to a walk. Why is it that, as I think of this purpose at, say, two o'clock, the excitement does not spread to the walk-element of my purpose-neurogram and so result in the ideo-motor act of starting for a walk *now*? The answer is, because my purpose is *not* to go for a walk *now*, but to-wait-until-three-o'clock-and-then-to-go-for-a-walk. The ideo-motor result of giving my

undivided attention to this purpose at any earlier time is 'to-wait...'; and this is what I do. The difficulty is due to our tending to economise thinking by taking the end of a purpose for the whole of it, as if getting up from a meal to which one has just sat down were the same thing as eating it and then rising from table.¹ We see, then, that the neurogram of a purpose must contain elements that correspond to the lapse of time before the final act: so that all purpose-neurograms possess common elements corresponding to future time and so form part of a 'future' interest-system.

Since some idea of myself enters into all my purposes, the neurogram of my 'self-regarding sentiment'² also forms part of my future interest-system. The neurogram of my purpose to go for a walk at three o'clock will therefore include elements corresponding to the proposed action, to the future time and to myself.

§ 2. NEGATIVE PURPOSES

Something must next be said about the neurograms of negative purposes. The surest way to avoid doing something is to avoid thinking of it. We have seen³ how the thought of a deed, if 'not kept from so doing by antagonistic representation present simultaneously to the mind', tends to be followed by the deed itself, performed as an ideo-motor act. We need not then distinguish between negative purposes concerned with action and those concerned with thought.

¹ If a reader still feels a difficulty, let him reflect upon the difference between neurograms for 'take the first turning to the right' and for 'take the second turning to the right'.

² See above, p. 77.

³ Above, pp. 130-132.

The neurogram of my purpose *never* to think of a thing—drinking spirits, for example, but we may call it *A*—must include my neurogram *A* of *A*. But if my purpose is not to think of *A* at a particular time, then my purpose-neurogram must also include a time element such as we have already discussed. We may, for the moment, leave it out of account, and consider the simpler case of my (negative) purpose *never* to think of *A*. If it is to be achieved, something must always divert the excitement from *A* before it becomes sufficient to make me attend to any idea of *A*.¹

Suppose now that *A* is intimately linked with some other neurogram (*O*, say) such that when *O* is stimulated, even slightly, a quasi-explosive² discharge of excitement through it causes it to drain all other active arcs. The result would be that, whenever *A* (an idea of *A*) tended to appear in consciousness, *O* would occur instead. And every time that *O* drained the excitement it would become connected with the other active neurograms besides deepening its link with *A*. These other active neurograms would include those through which the excitement had spread to *A*. *O* would thus gradually become directly linked to every neurogram with which *A* is connected and through which alone *A* may be excited. In the end, not only all ideas of *A*, but every thought connected with each of them, would be excluded from consciousness. The whole interest-system of which *A* formed

¹ We have pointed out above (p. 61) that I may have different ideas of an object *A* corresponding to different distributions of excitement in my neurogram *A*.

² Cf. the case of the lover's tap on the window quoted above (p. 102) from William James, whose explanation how so faint a stimulus to a system of arcs (corresponding to *O*, not to *A*, in the text) may cause that system to drain the impulse is that 'it finds a nerve-centre half ready in advance to *explode*'. (*Loc. cit.* Vol. 1, p. 450. Italics mine.)

part would tend to become 'repressed' or 'censored',¹ and *A* would never be excited.²

Now William James has observed that 'Some persons can voluntarily empty their minds and "think of nothing". With many... this is the most efficacious means of falling asleep.'³ Let us represent by *O* the system of arcs excited during the process of 'emptying the mind', and let us call the process the *O*-process. The process, or at least its motor and sensorial elements, differ in different individuals. In some 'this curious state of inhibition can for a few moments be produced at will by fixing the eyes on vacancy'.⁴ The *O*-process in another case has been thus described:

When in waking times I thus dismiss a thought I generally make a rapid but suddenly stopped turn of my head from that position which is natural to me in thinking to a rather forced and tense posture and... a number of muscles in the upper part of the body are held rather rigid; and the resulting complex sensory experience is very clearly apprehended. Even upon dismissing insurgent thought in order to go to sleep, I notice in myself attention to the sensations arising from respiratory movements and the like.⁵

In the present writer's own case, the *O*-process produces the following sensations: closing the eyelids, turning the eye-

¹ In a dream, excitement may perhaps spread to *A* by some other route than the neurograms of the associations of *A* in waking consciousness. Thus *A* may at least begin to be excited before the *O*-process (see below) begins to operate.

² Cf. J. C. Fluegel: 'Repression is apt to extend from the element of thought which was originally its object to other elements that are associated with it, the associations along which the repression extends being often, moreover, of the superficial type so characteristic of the Unconscious.' (*Brit. J. Psych.* Vol. VIII (1917), p. 493.)

³ *Loc. cit.* Vol. I, p. 404.

⁴ W. James, *loc. cit.* p. 404.

⁵ T. Loveday, *Brit. J. Psych.* Vol. VII, No. 2, p. 162.

balls upwards as if to make doubly sure of not seeing, closing and slightly compressing the lips, sharply inhaling through the nose, and, less certainly, a quick turning of the head to one side.¹

We have, then, in the *O*-process, whatever its form in any individual person, a mechanism that can make him, in his normal waking state, oblivious to an object *A* and to every one of its associations. It is only necessary that *O* should have been connected, voluntarily or involuntarily, with *A*. The neurogram of a negative purpose never to think of *A* need include no more than *A* and *O* together; and to *A* and *O* must also be linked the neurogram of a future time in order to form the neurogram of a purpose not to think of *A* at that time.

§ 3. PURPOSE AND EMOTION

It is important to know whether purpose-neurograms tend to be rich in emotional or 'affective' elements. Suppose, then, that it is my (positive) purpose to play in an exciting football match at three o'clock, instead of to go for a dull walk at that hour. Then my purpose-neurogram is enriched by affective elements. For that reason it is more likely to be excited;² and I am more likely to think of, and to reinforce, my purpose. And when the time comes to change for the game, a thought of my purpose will be very much more likely to occupy my mind and the appropriate movements to follow as ideo-motor acts. On both accounts, the

¹ In making voluntary use of this process for the purpose of falling asleep, I am conscious of two stages. In the first I feel the sensations described in the text. In the second stage I relax the effort involved in voluntarily stimulating the *O*-process.

² See above, pp. 108 and 111.

addition of suitable affective elements will strengthen my purpose and make its fulfilment more probable.

On the other hand my (negative) purpose never to think of A will have a harder struggle if A includes affective elements. In that case, a deeper link between A and O will be necessary to stop me from thinking of A. If the inhibition of thought about A is due to an effort of Will—that is, if Will formed the connexion between A and O—the effort must be the greater, the richer A is in affective elements.

§ 4. HOW PURPOSE-NEUROGRAMS ARE FORMED

We have now to consider how purpose-neurograms come to be formed. When defining conscious purposes, we distinguished¹ between ‘willed’ purposes on the one hand and those that are ‘approved,’ but not willed, on the other.

Let us first consider the origin of ‘willed’ purposes and their neurograms. We recall William James’ *dictum*, already² quoted, that ‘the soul *presents* nothing herself; *creates* nothing; is at the mercy of the material forces for all *possibilities*;³ but amongst these possibilities she *selects*; and by reinforcing one and checking others, she figures...as something from which the play gets moral support’. When a thought of something I might do occurs to me, whether in the course

¹ See above, p. 155.

² Above, p. 122. But see the third footnote on that page.

³ Cf. St Paul: ‘How shall they believe [by an act of Will] in him of whom they have not heard? and how shall they hear without a preacher? and how shall they preach unless they be sent?’ (Romans x. 14, 15.)

of my own thinking or as a suggestion from outside,¹ my Will may seize upon it and focus my attention upon it. If there is no antagonistic impulse present, the thing gets done there and then as an *ideo-motor* act. But if my thought of the thing is linked to a thought of some future time when I might do it, and if my Will focuses my full attention upon these two thoughts together to the exclusion of any antagonistic thought that may appear upon the fringe of my consciousness, then the act, the time for it and my self-sentiment have all been linked up. I have formed a *willed purpose*. Its neurogram is part of my 'future' interest-system.

Willed purposes, especially if their neurograms are rich in affective elements, may be of altogether paramount importance. For example, the act of faith by which some people accept religion, or the effort of Will by which they decide to act on a hypothesis with a view to verifying it,² is in many cases the turning point of their whole lives.

¹ There *may* be ways that cannot be described in William James' words as 'material forces' in which the elements of a purpose might be presented to the soul. It is not inconceivable that another Soul—God, perhaps—or other souls should communicate directly with our souls. In such a case it is possible to imagine that the other soul which communicates with mine does so either directly, soul to soul, or indirectly by first creating excitement in my brain. Since, however, my own soul cannot create, but only reinforce, excitement in my brain, it is not to be supposed that any other human soul has power to *create* excitement in my brain; but we may choose to suppose that God has it, and sometimes exercises it. It is, however, simpler, and therefore preferable, to suppose that all purely psychical communications proceed direct from soul to soul. If our first law applies, such a communication reaching my soul must, if and when it affects my consciousness, be accompanied by excitement in some neurones of my brain. And, if we regard the vision which led to the conversion of St Paul as a psychical communication of this kind, we have in his subsequent blindness some evidence of a neural accompaniment to the psychical process.

² See below, p. 289.

All the same, most of our purpose-neurograms are formed, without an effort of Will, by the flow of neural impulses directed by interest-systems. They appear to us as natural 'and *selbstverständlich*, an "*a priori* synthesis" of the most perfect sort', needing no explanation. It takes, in short, what Berkeley calls a mind debauched by learning to carry the process of making the natural seem strange, so far as to ask for the *why* of any ordinary human purpose, formed under the influence of instinct or other interest. The common man can only say, '*of course* the ordinary little boy purposes to follow his father's trade when he grows up; *of course* the ordinary little girl purposes to become the mother of a family; *of course* the youth purposes to win the love of the maiden, that beautiful soul clad in that perfect form, so palpably and flagrantly made from all eternity to be loved!'¹

To come within our definition of a purpose,² all these 'unwilled' intentions must at some time or other have received the full light of attention. When one of these intentions is first noticed, the Will may intervene either to repress it by linking it to the O-process, or else to strengthen it by deepening its neurogram. But if the Will does not intervene, the mere fact that the purpose has passed the censor without being repressed makes it an approved purpose.

In this account of the nature and origin of purpose-neurograms, we have distinguished between purposes that begin with an act of Will and those that are approved without effort when first thought of. In fact, however, the two classes of purposes are by no means mutually exclusive. When an

¹ Most of this paragraph comes from William James' chapter on Instinct. (*Loc. cit.* Vol. II, pp. 386, 387.)

² On p. 155 above.

effort of Will creates a purpose-neurogram it includes, as a rule, large elements already formed by other means. We have seen that the willed purpose-neurogram without affective elements will probably be but a poor and transitory affair. The purpose will be feeble and easily forgotten. The ephemeral character of mere good resolutions unaccompanied by some instinctive (affective) drive is proverbial.¹ On the other hand, whenever a conflict causes the Will to intervene in support of a purpose not yet willed but merely approved, the purpose-neurogram is deepened by the act of Will, reinforcing excitement; and thereafter the purpose is partly due to Will. When Professor Ramsay Muir tells us that 'Self-government had throughout the modern age been a matter of habit and practice with the British peoples; now [1815-78] it became a matter of theory and belief,'² he gives us an example of an approved purpose becoming, partly at any rate, willed.

§ 5. INFLUENCE OF PURPOSES ON THE STREAM OF THOUGHT

We have spoken of the 'future' interest-system which is made up of all purpose-neurograms, except perhaps the neurograms of general negative purposes: 'I will never think of so-and-so.'³ We have also remarked⁴ that purpose-neurograms for the most part include as part of themselves the self-regarding sentiment neurogram. Moreover, the neurograms of the stronger among willed purposes tend, as we have seen, to include other affective elements in addition to those of the self-regarding sentiment. Finally, those

¹ See below, p. 263.

³ See above, p. 158.

² *The Expansion of Europe*, p. 115.

⁴ See above, p. 157.

purpose-neurograms the origin of which is due to instinct or to interest rather than to Will are evidently connected to, and so may be said to include, the affective elements whose excitement first brought them into being. For all these reasons, the 'future' interest-system is apt to contain a large proportion of affective elements. That is to say, our interest in the future, if it is intense and wide (so that our purposes are strong and far-reaching), will tend to stir our emotions in no small degree.

This interest in the future shares with our other interests, and with incoming sense-impressions, the business of guiding our thoughts during involuntary thinking.¹ But the influence of the future-interest upon thought, and especially (through thought) upon conduct, is greater than that of most other interests equally deep and wide.

In the first place, a future-interest influences conduct directly, while the influence of other interests is in general only indirect. Suppose that my future-interest includes a purpose to visit Putney on boat-race day. During the weeks before the race, my newspapers have called my attention to the practice and the prospects of the crews; on each occasion I am reminded of my purpose, on which I see no reason to go back; and each time this happens my purpose is both

¹ Cf. McDougall: 'A conscious conative effort having once been made (an intention or resolution having once been formed, the will having been consciously set towards a given end), the conative process continues or may continue at work *sub-consciously* for a period of time to which we can set no definite limit. The "*Aufgabe*", the intention, may continue to play a prominent, a predominant, part, even when it has passed altogether from clear consciousness.' (*American Journal of Insanity*, Vol. LXIX, p. 870.) And Freud and members of his school have demonstrated the immense influence which sub-conscious conations exercise upon our mental life and conduct.

deepened and widened. At last the day arrives. Railway advertisements, newspaper posters, even the cars, decorated with ribbons of the rival blues, remind me that the time has come for my purpose to be fulfilled. Fulfilled it accordingly is, without effort of Will on my part. Indeed, no small effort of my Will, or some altogether exceptional sense-impression from outside, would then be needed to *prevent* its being carried out. On the other hand, an interest in rowing or in our ancient universities or even in a member of one of the crews, while before the day it might help to form a purpose to see the race, would not, apart from such a purpose and perhaps in face of some contrary purpose for spending the day, take me down the Fulham Road and over Putney Bridge when the day came.

In the second place, one's future-interest tends to influence almost every sort of conduct. Action, if neither reflex nor habitual, does not *immediately* follow upon the thought of it. The excitement corresponding to this thought finds no well-worn channels ready for it to spread towards the pyramidal tract so as to produce movement. It has, therefore, time to diffuse. It may spread to a number of linked neurograms before it ends in action. Consequences of the action thought of may thus come to mind before the action takes place, if indeed thoughts of these consequences do not lead to its being inhibited instead. These consequences lie in the future, and their neurograms therefore contain elements that correspond to future time. It follows, from the corollary to our third law,¹ that the 'future' interest-system—especially if it be wide and deep, covering most of future time, and rich in emotional elements—will tend to influence every action

¹ See above, p. 110.

except those that are reflex or habitual or otherwise¹ due to the existence of low-resistance, or 'canalised', paths. But when such paths exist, the excitement is drained along them towards the pyramidal tract without leaving time for diffusion to occur.

Thirdly, on account of its richness in affective elements, one's 'future' interest-system exercises a greater influence upon thought, and so upon conduct, than that of most other interest-systems equally wide and deep. That the presence of affective elements in an interest-system increases the influence of that system upon the flow of excitement through the brain we have already seen.² And we have also seen³ that the 'future' interest-system tends to contain a large proportion of these elements, a fact confirmed by Webb's research on *Character and Intelligence*.⁴

Here then are three reasons why a man's interest in the future is in a peculiarly strong position to influence his behaviour. They are that his future-interest has a direct effect upon his conduct; that its power extends to almost every sort of conduct; and that it tends to stir his emotions in a high degree. We recall the experimental evidence that the purpose-factor, 'persistence' or *w*, does in fact exercise a dominant influence upon success in school work as a whole.⁵ But we must not forget that, as we observed on p. 150 above, it is the combined effect of *g* and *w* that has to be considered

¹ In particular, actions towards which instincts strive often follow immediately—the excitement pursuing innately canalised paths (innate paths of low resistance)—upon the occurrence of an image of them in consciousness. That instinctive actions are apt to occur without regard for consequences is well known.

² See above, p. 111.

⁴ See above, p. 129.

³ See above, p. 165.

⁵ See above, pp. 142 and 149.

when we seek to measure the great power exercised over our behaviour by our purposes and by our future-interest in which they tend to become integrated.

It is because a wide and deep future-interest is in a peculiarly strong position for guiding thought and conduct that, where it exists, it constitutes, as we shall see,¹ one of the most important elements in character. Without it strength of character is impossible.

¹ See below, Chapter 15.

CHAPTER 9

CONFLICT

§ 1. CONFLICT AND WILL

WE broke off our discussion at the end of Chapter 6 in order to study the relation of Will to certain 'group factors' in mental processes and, in particular, to the purpose-factor, *w*. We now come back to the function of Will in everyday life.

The Will, as a rule, intervenes when the involuntary guides of the stream of thought are in conflict.¹ Recalling our third law and its corollary we see that such a conflict will occur if two active neurograms are about equally excited, or belong to rival interest-systems more or less equally deep and wide. When this happens, the Will may intervene to resolve the conflict. It will then augment the excitement in one or other of the rival systems (or in some other neurogram) and so decide between (or against both of) the conflicting claims to direct the stream of thought.

No more need be said about a conflict between two isolated neurograms. But we need to look further into the case of a conflict between a powerful interest-system on the one hand, and an intensely excited but comparatively isolated neurogram on the other. A typical case occurs when the fulfilment of a purpose is obstructed by sense-impressions, whether from inside or outside the body. They distract attention from the business in hand; and the Will must

¹ See above, p. 133.

revive attention in order to prevent distraction from occurring and cause the purpose to be achieved.

Suppose, for example, that I wish to unscrew a metal lid from a glass jar. My first thought is of the jar with the lid stuck fast. Its neurogram is represented by *A*. My purpose is to grip the jar tightly with one hand and the lid with the other, and to twist one hand round the other without my fingers slipping. To this complicated movement corresponds the excitement of *Z*. When the movement takes place and *Z*

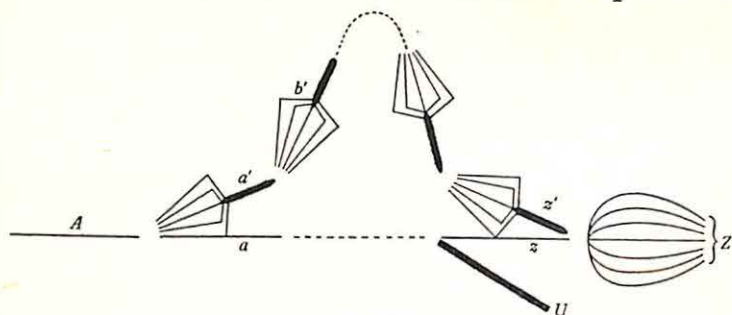


FIG. 5

drains the excitement the lid is unscrewed. But if the lid is stuck very fast a great effort of my Will is required in order that I may grip the jar and lid so tightly that, when I twist my hands, my fingers shall not slip. Ultimately, a point is reached when the pressure upon my fingers hurts so much that my Will is unequal to the task of making them grip more tightly.¹ The unpleasant feeling, and the relaxation of my grip that results from it, corresponds to the excitement of *U* in the diagram.

If the lid begins to turn before the unpleasant feeling becomes too great, I excite the direct path *Aa...zZ*

¹ My failure is not due to the tearing of my muscles. That could only happen in a state of maniacal excitement beyond the power of voluntary effort to produce.

sufficiently to lower its resistance below that of the path $Aa \dots U$. But if a direct effort of Will is unequal to this task, I can only achieve my purpose by finding an indirect path from A to Z and so avoiding U .

Reasoning is the process by which the Will may make a *new*¹ indirect path of this kind. To do this the Will first adds to the excitement in Z . But, in the case before us, it is not enough to concentrate excitement in Z so as to resolve the conflict without reasoning. Z , however, remains active and ready to assist in guiding the excitement towards itself. This guiding continues throughout the process; it works by facilitation, or multiple stimulation, in the manner already² described; and it consists, as we have seen, in the excitement always tending, when other things are equal, to flow through the paths that are most closely connected with the active interest-system, Z .

My Will next concentrates excitement in A . My attention is focused upon the jar with its stuck lid. The excitement now spreads to many linked neurograms $a, a', a'', \dots$. Concentration of excitement in a would lead not to z and so to Z , but to U instead. So excitement is next concentrated in a' . From a' it diffuses to many others, including b' . After diffusion, convergence. Excitement is now concentrated upon b' . So the process goes on until, if it succeeds, Z is reached through one of its connexions, z' . The excitement then drains from A to Z along the path $Ad' \dots z'Z$.

When I concentrated my attention on **A**, the thought of

¹ W. James (*Principles of Psychology*, Vol. II, p. 330) makes 'ability to deal with NOVEL data the technical differentia of reasoning' and so marks it off from common associative, or involuntary, thinking. Cf. the passage quoted from Burt on p. 145 above.

² See above, pp. 98, 103 and 106; and below, pp. 236, 268.

the jar with the stuck lid, and the excitement spread from *A* to *a*, *a'*, *a''* . . . , my thoughts became *a*, *a'*, *a''*, ... The first of these, *a*, was an idea of 'taking hold and starting to unscrew'. But it led to *U*, so that *U*, and not *Z*, came to be thought of. Suppose that *a'* represents the thought that the lid is too small for the jar; *a''*, the thought that the lid is stuck to the jar by some such substance as candle-wax; and so on.

While my attention is concentrated on the jar with its stuck lid, I realise, not merely that the top is stuck, but that it is stuck at a particular place, or stuck because it is too small (*a'*), or stuck by some such stuff as candle-wax (*a''*). I next concentrate on one of these ideas: for example on *a'*, that the lid is too small. As the excitement diffuses from the corresponding neurogram (*a'*) a number of associations of this thought (*a'*) of smallness come before my mind. Their vividness depends upon the excitement of the corresponding neurograms. That excitement may be partly due to stimuli arriving from my purpose-neurogram (*Z*), which remains active all the time. One (*b'*) of these associations of smallness may well be that the lid has contracted in cooling more than the glass jar:¹ the lid may be too cold, and may expand again on heating. Once more, I concentrate on this thought; and diffusion then brings the thought (*z'*) that heat will come from the friction of my fingers. After diffusion, convergence. As I concentrate on this new thought (*z'*), my fingers rub the lid until it turns freely in my hands. The conflict has been resolved by reasoning.

¹ The similarity between the lid and the jar, in that both react to heat by expanding although at different rates, when noticed for the first time, provides the appropriate stimulus to curiosity (see below, p. 238); and this instinct, as explained in Chapter 12, may give essential help to the reasoning process in solving the problem.

We have more to say about reasoning. But before we leave the diagram (Fig. 5 on p. 170), we may use it to illustrate the bringing back of a wandering attention in order to fulfil a purpose. If, as in the case of the glass jar, **U** represents a distracting thought, perhaps a sense-impression from outside or inside the body, the Will may add to the excitement of *z* and *Z* so that they, and not *U*, drain the excitement and prevent distraction by **U**. Or *U* may correspond to some lower propensity of instinct or of habit, while *Z* corresponds to an ideal impulse. Thus William James writes:

The ideal impulse [when compared with the propensity] appears a still small voice which must be artificially reinforced to prevail. Effort is what reinforces it, making things seem as if, while the force of propensity were essentially a fixed quantity, the ideal force might be of various amount. But what determines the amount of the effort when, by its aid, an ideal motive becomes victorious over a great sensual resistance? The very greatness of the resistance itself. If the sensual propensity is small, the effort is small. The latter is *made great* by the presence of a great antagonist to overcome. And if a brief definition of ideal or moral action were required, none could be given which would better fit the appearances than this: *It is action in the line of the greatest resistance*. The facts may be most briefly symbolized thus: **U** standing for propensity, **Z** for the ideal impulse, and **W** for the effort:

$$\mathbf{Z} \text{ per se} < \mathbf{U}$$

$$\mathbf{Z} + \mathbf{W} > \mathbf{U}.$$

In other words, if **W** adds itself to **Z**, **U** immediately offers the least resistance, and motion occurs in spite of it. But the **W** does not seem to form an integral part of the **Z**. It appears adventitious and indeterminate in advance. We can make more or less as we please, and *if* we make enough, we can

convert the greatest mental resistance into the least. Such, at least, is the impression which the facts spontaneously produce upon us.¹

§2. SOME ASPECTS OF REASONING

We may use the figure on p. 170 to illustrate some aspects of reasoning in general.

We have already seen that reasoning involves making new associations.² Novelty, '*ability to deal with NOVEL data*', constituted, in William James' view, '*the technical differentia of reasoning*'.³ Willed concentration of attention is part and parcel of all but the simplest, if not indeed of all, reasoning. The *new* association paths made by reasoning are shown in our diagram (Fig. 5).

Next we notice how important is the concentration of attention, or of neural excitement, during the reasoning process. When, for example, *a'* and *a''* both came into my mind together, my reasoning would have ended there had I failed to concentrate on *a'* and to leave *a''* out of account for the time being. I had, in fact, to concentrate on the thought that the lid was too small, without further considering, just then, that it might be stuck with candle-wax. Thus, in reasoning the neural excitement is more strictly localised than in involuntary, or common associative, thinking. 'The first thing', says William James,⁴ 'is to have seen that every possible case of reasoning involves the extraction of a

¹ W. James, *loc. cit.* Vol. II, p. 549. The letters are changed to fit our diagram.

² See above, p. 171.

³ *Loc. cit.* Vol. II, p. 330, already quoted above, p. 171.

⁴ *Loc. cit.* Vol. II, p. 341. Cf. also p. 330: '*Reasoning may then be very well defined as the substitution of parts and their implications or consequences for wholes.*'

particular aspect [say *a'*] of the phenomena thought about [*A*], and that whilst Empirical Thought simply associates phenomena in their entirety, Reasoned Thought couples them by conscious use of this extract'¹ or abstracted essence.

If, for example, in mathematical reasoning we mention 'force', we mean force as defined by Newton: that which changes or tends to change a body's state of rest or of uniform motion in a straight line. We do not think of force of character, or of a patent food, or of any other common meaning of the word. The neurogram excited is correspondingly limited. (But when we try to reason about 'education' or about 'character' we often fail to limit the excited systems of neurograms in this way.) It is because voluntary concentration of excitement is characteristic of all reasoning that reasoning is essentially a process of voluntary, or willed, thinking.

For another reason also, concentration is of extreme importance in the reasoning process. According to our second law of thought, the greater the concentration of

¹ William James gives another reason why particular partial aspects, or essences, of concrete facts are used in reasoning instead of the complete facts from which they are extracted. He asks 'Why are the couplings, consequences, and implications of extracts more evident and obvious than those of entire phenomena?' And he answers by pointing out, first, that 'the extracted characters are more general than the concretes, and the connections they may have are, therefore, more familiar to us, having been more often met in our experience'. He continues: 'The other reason why the relations of the extracted characters [for example *a'*] are so evident is that their properties are so *few*, compared with the properties of the whole [*A*, for example], from which we derived them. In every concrete total the characters and their consequences are so inexhaustibly numerous that we may lose our way among them before noticing the particular consequence it behooves us to draw. But, if we are lucky enough to single out the proper character, we take in, as it were, by a single glance all its possible consequences.' (*Loc. cit.* Vol. II, pp. 341, 342.)

excitement in any one of the linked neurograms—say, in a' —that make up the new path from A to Z (in Fig. 5, p. 170), the greater, in general, will be the number of neural arcs into which the excitement diffuses. The greater therefore will be the number of neurograms (b' , b'' , ...) from among which the Will may choose one (b') in which to concentrate excitement next. In other words, the greater a man's power of concentration, the greater *ceteris paribus* will be his choice of new paths for his reasoned thought and the greater therefore will be his chance of finding a solution for his conflicts or a way out of unprecedented situations.

But the variety of different ideas that may occur to me during the diffusion stage (from a' , say) does not depend only upon my Will. It may also depend upon group factors—notably persistence (w) and cleverness or fluency—such as were described in Chapter 7. It may be influenced by excitement diffusing from Z . And it certainly depends upon my relevant knowledge: that is, upon the number of my neurograms already connected with a' . The greater my Will, my purpose, and possibly other group factors, and my knowledge of the matter in hand, the greater will be the number of associated thoughts that may appear on the fringe of my consciousness as I concentrate my attention on a' ; or, in other words, the greater will be the number of the neurograms into which excitement diffuses from the neurogram a' in which it has been concentrated. My chance of successfully completing the reasoning process by finding a new path $Aa'b' \dots z'Z$ from A to Z therefore depends upon my Will, my purpose-factor (w), maybe other group factors, and my relevant knowledge.

§ 3. CONFLICTING INTERESTS

We have now to consider conflicts between two rival interest-systems. In order that they may be in conflict, they must be excited at the same time. They must, on this account if for no other reason, have some element in common. Hart gives, as an example of such a conflict, the case of a lover the object of whose passion is already the wife of another man. 'The lover's mind will then exhibit two complexes trending in opposite and incompatible directions, on the one hand the desire for the woman, on the other the opposing tendencies constituted by moral education and fear of consequences.'¹ Here the complexes or interest-systems meet in the lover's neurogram for the woman.

We have seen² how a link with an interest-system tends to make an active neurogram, *A*, drain the excitement from all the others, *B*, *B'*, . . . , that are active at the same time. When this happens, the original link is deepened; for the synapses between the interest-system and *A* are lowered by the passage of excitement across them.³ At the same time, the other active neurograms, *B*, *B'*, . . . , become linked to *A* and, through it, to the interest-system, as excitement spreads across the intervening synapses and lowers their thresholds. But the links between *B*, *B'*, . . . , and *A* are not likely to be so deep as between *A* and the interest-system; for this last link was already being *deepened* when the others were being *formed* for the first time.

When the process is repeated, because one of the neurograms, say *B*, just connected through *A* to the interest-

¹ *The Psychology of Insanity*, p. 78.

² On p. 112 above.

³ E.g. from *B* to *D* in Fig. 4 on p. 110.

system drains the excitement from any others, $C, C', \dots$, that happen to be active at the same time as itself, all the neurograms we have mentioned become linked, directly or indirectly, to the interest-system and so come to form part of it. But the links tend to be deepest between the interest-system and the neurogram, A , originally connected to it; for they have been deepened at least twice since first they were formed. The links between A and B have been deepened once, when the excitement from $C, C', \dots$ was drained through B and on through A to the centre of the interest-system. Thus they tend to be deeper than those between B and $C, C', \dots$, which have only just been added to the interest-system.

We thus see how, as an interest-system gradually grows wider every time it is excited, it also becomes deeper, and usually deepest towards the centre.

It follows that, from any neurogram on the outside of an interest-system, the excitement tends to flow inwards towards the heart of the system where the synaptic thresholds are lowest. Such a system we shall describe as an 'endarchy',¹ because its innermost regions, being deepest, rule the rest of it.

When two such systems are in touch the excitement at the point of contact will tend to flow in two opposite directions, one leading to the centre of each system. This, then, is the neural condition of a conflict between two interest-systems: they must have a narrow zone of contact and be excited from that zone.

Conflicting interest-systems have some resemblance to opposing armies. Each of them is organised 'endarchically'.

¹ From $\epsilon\nu\delta\omicron\nu$ = 'within' and $\acute{\alpha}\rho\chi\acute{\eta}$ = 'supreme power'.

To the zone of contact between the interest-systems correspond the front-line soldiers who are but a small part of the hostile forces. The opposing armies, like the interest-systems, meet in the narrow zone of conflict, but their centres are far apart. The central elements in each of the contending armies influence their front-line elements in opposite directions. Were it not for these influences, the front-line troops on opposing sides might fraternise, as happened on Christmas Day, 1914. In the same way, the outside elements of rival interest-systems would quickly link up where they are in contact, were it not for the influence of the central elements of each system.

When two conflicting interest-systems are evenly balanced, the conflict can only be resolved with help from the Will. But when the balance is uneven, or if one system is more intensely excited than the other, the stream of thought generally flows on without the Will's intervention.

When, for example, the expert climber finds it necessary to rely only upon his handholds while he swings his body round a buttress of rock that overhangs a precipice, he does not hesitate. He makes no effort of Will. He does not have to weigh his purpose of continuing the climb against the danger of a fall. He does not think of what may happen if he lets go. For the excitement of his fear-neurogram is so much less than that of the purpose-neurogram of his climb that the former drains involuntarily into the latter, according to our third law, and merely adds to the excitement available for climbing. The novice, on the other hand, who first meets such a place on the mountains, will feel differently about it. His sense of danger may balance, or even over-balance, his purpose to complete the ascent. It is only by an

effort of Will that he increases the excitement of his purpose-neurogram, concentrates upon the climb before him, and so resolves the conflict between his opposing tendencies to turn back and to go on. When, by an effort of Will, he has decided to go on, the continued activity of his fear-neurogram no longer tends to turn him back, but makes him take a firmer grip of his handholds and so helps him to climb.

Now, the climber who has known the mountains from his youth and has gradually become accustomed to more and more difficult places, like the Cockney who has been born and bred in London and has grown up with the increasing danger of street traffic, may never have been called upon to exercise such an effort of Will as is required of one who has to face a great precipice, or a crowded thoroughfare, for the first time. Yet the strong-willed tourist new to the mountains, or the country cousin come to town, may by efforts of Will become as callous as the native to a particular kind of danger. This result can only have been achieved by the modification of the stranger's neurograms into the likeness of those of the native. It follows that a series of efforts of Will, and therefore a single effort of Will, may alter the links between neurograms in the same way as they are changed during the involuntary resolution of conflicts.

Introspection suggests that conflict between two evenly balanced interest-systems increases the total excitement of the brain. The intervention of the Will would, as we have seen reason to believe, increase the excitement. But, even before that happens, there may well be some increase due to the circular nervous processes¹ set going in the affective elements of both interest-systems. Anger may add further to

¹ See above, p. 70.

the excitement, since the obstruction of any instinctive process, such as the functioning of the conative elements in either of the conflicting systems, is the normal stimulus to anger.¹

At all events, if the total excitement of my brain does in fact increase when two interests come into conflict, the result must tend to make me conscious of the thought at the parting of the ways, the thought which the two interests are trying to develop in opposite directions. This enables my Will to intervene; for it can only operate upon thoughts that are already in the field of consciousness. Even if, up to this moment, my mental process has been unconscious, the sudden increase of excitement may make me aware of it. My Will can then step in to resolve the conflict.

When, even with the added excitement from the anger-process, the Will is unequal to the task of resolving a conflict between well-balanced interest-systems, there is one other primary emotion—'distress'—that may come in to help. This state of feeling is frequently observed in children. McDougall writes:

Children very early display this reaction, which consists essentially in loud cries, sobbing, and tears.... The state of feeling or emotion that accompanies this reaction is, I submit, properly called distress; and the feeling, together with the complex unlearned reaction, common to all members of the species, must be ascribed to an innate affective disposition which, like that of anger, does not seem to be innately connected with any innate cognitive disposition; for, like the disposition of anger, it seems to be excited only secondarily to other impulses. The typical result of the thwarting in the child of any strong impulse is first anger and then, if the

¹ See McDougall, *Social Psychology*, p. 59.

impulse thus re-enforced still fails to attain its end, distress. That is to say, we are endowed with this innate tendency to relax our efforts and to cry aloud for help whenever we 'come to the end of our tether', when we feel that our powers are quite incapable of coping with the situation. The biological value and function of this reaction are obvious; it seems to be primarily a function of infancy and childhood, when the help of older persons is so often required: but it seems to persist in the female sex into adult life; and even strong men, when their utmost efforts prove unavailing, sometimes break down and cry aloud for help on whatever higher powers they may have learnt to conceive, thus showing that in them also this disposition is not wholly transitory.

The two emotions of anger and distress occupy, then, a position unlike any others. They spring from innate affective dispositions and therefore have their specific bodily tendencies and expressions; but they differ from the others in depending for their arousal, not upon any particular objects or sense-impressions, but upon the thwarting of other impulses.

This affect, properly called 'distress' . . . , must be ranked with the primary emotions.¹

The function of distress, then, seems to be to sweep away the anger and the striving—a *κάθαρσις τῶν παθημάτων*—to provide an outlet for the remaining activity of the excited interest-systems. Even if the help asked for from outside sources does not come in the way the subject expects, he can try afresh to resolve his conflict, relatively unhampered by the memory of his former failure or by the interest-systems that were active in his previous futile efforts.

¹ *Proc. Aristotelian Society* (1915), *Symposium on Instinct and Emotion*, p. 28.

§ 4. THREE WAYS OF RESOLVING CONFLICTS

Let us look more closely at the neural changes made in resolving a conflict between two interest-systems.

Whether the conflict is resolved with or without help from the Will, its neural counterpart consists in excitement passing through neurograms that connect the two otherwise separate systems. The excitement tends to flow towards the centre of each system. It is thus attracted in two opposite directions at the same time. Therein lies the conflict. It may be resolved, voluntarily or involuntarily, in one or other of three ways.

The first is 'integration'. It is nearly always voluntary. It consists in linking up the two interest-systems so that each becomes part of one and the same larger system.¹ The excitement then tends to flow only towards the centre of this larger system. The conflict is thus ended.

The second method is 'disintegration'. It is generally involuntary and often pathological. It involves disconnecting one of the conflicting interest-systems from the other, and generally from the rest of the neurography at the same time.² The disconnected system may be linked with the O-process,³ so that it is never brought to mind during waking consciousness. The conflict is then repressed.

The third way combines integration with disintegration. For example, the excited neurograms of one system may be disconnected from those of the other while the centres of

¹ We shall see later, in chapter 12, that this method generally makes the neurography correspond more nearly to external reality. The thinker comes nearer to the truth.

² This method generally involves ignoring one aspect of the truth.

³ See above, p. 159.

the two systems are linked together.¹ Then the excitement no longer tends to flow in opposite directions.

Our military analogy² will serve to illustrate these three ways; but let us think this time of a civil war. The first way of ending it would be to bring the rival governments together and to arrange a just settlement of the quarrel between them. The governments then amalgamate, their headquarters staffs unite, and the lower ranks begin to fraternise. The two armies coalesce from the top downwards or from the centre outwards. Instead of two forces in the State, there is only one. This is (voluntary) integration, the ideal solution.

Next suppose that one side conquers the other, and the victorious government dictates a Carthaginian peace. The beaten party ceases to exercise any power in the State; and, until the memories of the war have faded or the defeated side gathers strength to renew the conflict, disintegration and repression are the result.

The third solution might consist in the two sides, perhaps as a result of intervention from abroad, patching up a peace of some sort, without much regard to the rights and wrongs of the quarrel. The country might be divided into two provinces under a federal government, each managing its own internal affairs but both agreeing to differ about the best way of doing so. Here would be a case of disintegration combined with integration; or, in Freudian terminology, of displacement; or, if the new constitution worked better than that which led to the civil war, of 'sublimation'.

¹ We shall see that this method commonly implies a confession of failure to agree upon the truth. It may result in an agreement to differ, at least for the time being. Or it may replace truth by fantasy.

² See above, pp. 178, 179.

But, without resorting to analogy, it is easy to illustrate the three methods of solving a conflict.

§ 5. INVOLUNTARY METHODS OF RESOLVING CONFLICTS

Take first conflicts that are resolved without any act of Will.

Integration, as we have said, is seldom involuntary. As a rule it does not differ from conscious control. An example of the comparatively rare involuntary integration would be the performance, due to a sudden stimulus, of a complex movement which the Will had not been able to bring about. When the novice on skis has been trying, time after time but without success, to perform a Christiania swing—a sudden turn by which the ski runner, speeding down a snowfield, may stop himself almost instantaneously—he may give it up, abandon the practice slopes, and go for an excursion on the mountains. He is running swiftly down what he supposes to be a smooth incline, when suddenly he sees a dangerous crack into which he must fall unless, despite his speed, he can turn to avoid it. Immediately, and without difficulty, he is saved from the danger by a perfect swing.¹ And the excitement accompanying the involuntary integration that we have described may have been so great that the ski-er may, for the future, be able to perform the

¹ What has doubtless happened is that the sudden fearful vision has excited his fear-system as well as his swing-neurogram; so that, before the turn has well begun and before the semi-circular canals connected with the opposing balance-neurogram have become excited, the inrush of excitement from the fear-system into the swing-neurogram so lowers the resistances of all its synapses that it drains all the other excitement arising during the turn. The image of the turn held the focus of consciousness against all comers.

Christiania swing at will. Another example of involuntary integration is afforded by one who has practised swimming movements on dry land, but only learns to swim when he is suddenly thrown into deep water; or by the involuntary formation of novel neural connexions in the animal who learns a new trick under the influence of fear or pain.

The Freudian literature abounds in examples of disintegration and repression. The following case is cited by Hart from Professor Janet:

Irène had nursed her mother through a prolonged illness culminating in death. The circumstances connected with the death were peculiarly painful, and the event produced a profound shock upon Irène's mind. She had been deeply attached to her mother, and the latter had filled the chief place in all her thoughts, ambitions and activities. Her mother's death, therefore, not only produced a great grief, but it deprived all those ambitions and activities of their main object and end. The ideas connected with the mother's illness and death formed a system or complex intensely painful and repugnant to the personality as a whole. A conflict was thus produced between the complex in question and the personality apart from this complex or interest-system. 'To get rid of this conflict, the mechanism of repression was brought into play. The painful complex was dislocated from the remainder of the mind, and no longer allowed to introduce its constituent ideas and emotions into the field of consciousness.'¹ Thus an abnormal mental condition developed, characterized by the frequent appearance of symptoms resembling those exhibited by the ordinary sleep-walker. Irène, perhaps engaged at the moment in sewing or in conversation, would suddenly cease her occupation and would commence to live over again the scene of her mother's death, carrying out every detail with

¹ *Loc. cit.* p. 93.

all the power of an accomplished actress. While this drama was in progress, she was perfectly unconscious of the actual events happening in her environment, heard nothing that was said to her, and saw nothing but the imaginary scene in which she was living at the moment. This somnambulism would end as suddenly as it had begun, and Irène would return to her former occupation, absolutely unaware of the fact that it had ever been interrupted. After an interval of perhaps several days, a second somnambulism, resembling the first in all respects, would appear in the same abrupt manner. If the patient were interrogated during the apparently normal intervals, it would be found that she had not only entirely forgotten everything which had happened during the somnambulism, but that the whole system of ideas connected with her mother's death had completely disappeared from her mind. She remembered nothing of the illness or its tragic end, discussed her mother without emotion, and was reproached by her relatives for her callous indifference to the whole subject.

In Irène's case, dissociation or disintegration was confined to the 'ideas connected with the mother's illness and death'. But dissociated interest-systems may attain to any degree of complexity and development.¹ In cases of so-called double personality, the dissociated system may be as extensive as the rest of the subject's neurography. We cannot then speak of one system as 'the dissociated system', for the whole neurography is disintegrated into two systems of equal complexity.

Involuntary disintegration combined with integration, or involuntary displacement, may be illustrated by another case of Hart's.² A patient in whose life a lady of the name of Green played a very prominent part, was asked, 'Do you know a Miss Green?' He replied, 'Green, that's green, that's

¹ See above, pp. 158, 159.

² *Loc. cit.* p. 110.

blue, would you say that water is blue?' Here the neurogram excited by the word 'Green' was involuntarily disconnected from the interest-system corresponding to the lady, and connected instead—or, rather, more deeply connected—to the colour interest-system, and especially to that part of it corresponding to the colour blue-green. Had the neurogram of green (including both the lady and the colour) been entirely repressed, the patient would not have noticed the word 'Green' in the question. But cases of involuntary disintegration combined with integration are not all pathological. The politician¹ whose party interest-system 'will reinforce in his mind those arguments which support the view of his party, while it will infallibly prevent him from realising the force of the argument propounded by the opposite side', is a case in point. Hart adds: 'Now, it should be observed that the individual himself is probably quite unaware of this mechanism in his mind.' The party political interest-system has, on the one hand, a disintegrative action upon the argument that is trying to build up a conflicting system out of the series of neurograms which it successively excites. On the other hand, it has an integrative action upon those elements which it picks out and connects to itself.

In these examples, the disintegrative or repressive part of the process has been far more marked than the integrative part. Hart indeed employed them to illustrate repression alone. In other cases the integrative action may predominate over the disintegrative. Of such a kind are many pathological cases of phobias, obsessions and the like, where the integration that builds up the interest-system around the phobia-neurogram far exceeds the disintegration that severs the

¹ Hart, *loc. cit.* p. 65.

phobia-neurogram from the system of which it originally formed part. For example:

Late one evening a soldier in an Indian frontier station, from which several sentries had mysteriously disappeared at night, hears a slight disturbance outside the compound, and goes out to investigate among the trees near by. He rescues the sentry, who is at grips with two dark figures, when, from a branch overhead, a third black shape falls upon him with outstretched blade. He is only just in time to avoid the blow. Years afterwards, returning from France with shell-shock, he has no recollection whatever of the Indian incident, but his whole life is coloured and distorted by an unreasoning fear of trees, especially after dark.

The fear of trees has been disintegrated from its connexions with a certain night in India, but has been integrated with other neurograms to form a far vaster interest-system, so wide as to be excitable through a multitude of everyday happenings.

Such involuntary displacements are usually of slow growth. They are by no means always injurious. On the contrary, they may be most beneficial. They are then commonly called 'sublimations' instead of 'displacements'. A sublimation is, in fact, a displacement disintegrating the affective elements from an interest-system that makes for evil and integrating them instead with a rival system of good tendency. The 'bad' system is then deprived of its driving power, while the influence of the 'good' system—probably part of the 'future' interest-system—is increased. Later on we shall discuss what these 'good' elements are, and how they differ from those that are 'bad'. Professor Fluegel illustrates sublimation by such changes in neural connexions 'as are effected in a man who, originally endowed with impulses

prompting to cruelty and sadism, becomes an efficient surgeon, soldier or butcher'.¹ He adds that

the more advanced forms of Sublimation are in most cases processes of gradual growth through successive steps, each more remote in nature from the original expression of the tendency, and each representing an advance from the moral point of view. Thus we must not grow impatient if in the first stages there is to our eyes still too much resemblance to the original activity, e.g. if...the subsequent surgeon early displayed an undue tendency to pull to pieces flowers, toys or other objects or to behave in an aggressive and cruel manner in his relations with other children. The gulf between the original tendencies and their ultimate expression is obviously far too wide to be bridged by a single step, especially when we are dealing with minds that are still immature. For this reason it would seem very undesirable in educative practice to extend our taboos and prohibitions beyond the sphere in which they are strictly necessary, lest in so doing we interfere with the initial stages of Sublimation. A school or home (or even a country) in which everything is forbidden will probably afford a relatively unfavourable atmosphere for the growth of Sublimation.²

Young men are less likely to become bullies and hooligans, a menace to peace at home and abroad, if they have ample opportunities for sports like football or rowing where the same instincts can find innocent expression.

§ 6. CONFLICTS RESOLVED BY THE AID OF WILL

We turn now to the rôle of the Will in resolving conflicts between rival interests. The three ways of resolving such conflicts with the help of the Will may be illustrated by an example from experimental physics.

¹ *Brit. J. Psych.* Vol. VIII, p. 485, where other examples are also given.

² *Loc. cit.* pp. 486, 487.

Suppose that we know the constitution of blue cobalt glass such as is used in lamps over the entrances to police stations, and some optical properties of the colouring matter. We can then calculate that the glass will absorb yellow and green light more than red, and red light more than blue. In fact, our calculations tell us that sunlight—containing red, yellow, green, blue and violet light in known proportions—will appear blue-violet when looked at through the cobalt glass, because more of the yellow, green and red rays than of the blue will have been absorbed on their way through the glass.

Then suppose that, in order to test our calculations by experiment, we look at a gas flame through the glass. It appears red, not blue! So we have a conflict between the blue of theory and the red of practice. The conflict may be resolved, after a fashion, in any one of the three ways discussed in the fourth section of this chapter.

Take first the way of disintegration or repression. We may try to forget, and in time succeed in forgetting, that we ever tried the experiment. The neurograms of the evidence of our senses that the flame looked red, and of our feelings about it, are then repressed or dissociated. The conflict between our wish to believe the evidence of our senses and our confidence in the result of our calculations has disappeared; and we rest assured that theory is correct in telling us that white light shining through cobalt glass appears blue. The obvious dishonesty of this solution may well be a particular case of a general ethical inferiority of this method—repression or disintegration—of resolving conflicts.¹

Some conflicts may, however, be best resolved in this way. If I am out for a walk in the country and meet a fork in the

¹ Cf. Fluegel, *loc. cit.*

road, it may not matter which turning I take. My proper course is not to stand hesitating between the two, but, perhaps after tossing a coin, to choose one or the other. My choice consists in concentrating on the thought of the road I am to follow, and so repressing the thought of its rival. Conflicts of this type may seem unworthy of serious consideration, but Fluegel has pointed out¹ that they are distressingly frequent in some minds.

We come back to the blue glass in theory and experiment. The second way of resolving the conflict with the aid of Will is by disintegration combined with integration: in short, by displacement. I may say to myself, almost in the words of Hart's patient,² 'Red, that's crimson, that's purplish, perhaps quite purple, or say blue.' In this way I concentrate upon and extend any 'blue' element there may be in my neurogram of the experiment, and ignore the 'red' elements, until, by a combination of integration with disintegration, I have displaced this neurogram so as to coincide with that of my theory.

This process would be an example of 'rationalisation'. So also is the puritan councillor whose aesthetic sense was offended by galvanised iron receptacles for sand and gravel placed by the roadside of his city. He would not acknowledge that aesthetic ideas had any part to play in human life. When therefore he protested in the City Council against the use of the iron boxes and was asked why he objected to them, the only reason he could give was that 'they might afford a murderer an easy means of disposing of the body of his victim'.

¹ *Loc. cit.* p. 495.

² 'Green, that's green, that's blue...'; see above, pp. 187, 188.

Of a similar kind are all the multitude of rationalisations by which men, ignorant of the true origin of their opinions, voluntarily inter-connect them so as to form a kind of caricature of a perfectly integrated mind. This caricature differs from the real thing in that the truly reasoned view will fit experience as it grows, while growing experience will continually be in conflict with vain rationalisations such as, according to Mr Trotter, largely constitute the mental furniture of the average man:

He will have fairly settled views upon the origin and nature of the universe, and upon what he will probably call its meaning; he will have conclusions as to what is to happen to him at death and after, as to what is and what should be the basis of conduct. He will know how the country should be governed, and why it is going to the dogs; why this piece of legislation is good, and that bad. He will have strong views upon military and naval strategy, the principles of taxation, the use of alcohol and vaccination, the treatment of influenza, the prevention of hydrophobia, upon municipal trading, the teaching of Greek, upon what is permissible in art, satisfactory in literature, and hopeful in science.¹

In so far as these views are in conflict with each other (internal conflict) or with his experience (external conflict) as it develops, he represses—disintegrates—the disharmony; and it is this admixture of disintegration with voluntary integration which justifies the inclusion of these examples of everyday rationalisation under the head of voluntary displacement, or voluntary disintegration combined with integration.

Finally we come to the third—the ideal²—method of

¹ W. Trotter, 'Herd Instinct', *Sociological Review* (1908), quoted by Hart, *loc. cit.* p. 135.

² See above, p. 133.

solving a conflict. This is by voluntary integration or conscious control. Integration in the case of the cobalt glass involves linking my neurograms of theory and experiment by means of a new path; and the process by which the new path is made is, as we said,¹ that of reasoning. This new path is made by observing that the red colour of cobalt glass seen by gaslight is only a particular case of its BLUE—RED—green—yellow colour seen by sunlight; for gaslight lacks nearly all the blue of sunlight, and its yellow and its green are largely absorbed by the glass. Thus the transmitted portion of gaslight must be almost pure red; and this deduction from theory accords exactly with the result of experiment.

¹ See above, p. 171.

CHAPTER 10

THE ORGANISATION OF THOUGHT

§1. THE WORLD OF EXPERIENCE

KNOWLEDGE of the 'real' world, the world of experience, is used in reasoning about it. Unless that knowledge fits experience, the new path formed by reasoning will not lead to a solution of a conflict. Each step in the reasoning process must therefore be *true*, if (with William James¹ and Hans Driesch²) we regard as true whatever fits experience.

Take, for example, the conflict between pain and purpose in the case of the stuck metal lid.³ If I had wrongly supposed that the lid would contract instead of expand on being heated, I should have failed to unscrew it. For successful reasoning about the 'real' world, each link in the chain of thoughts, or of neurograms successively excited, must correspond to a 'real' fact. There are such facts in the world of our experience.

Suppose that *p* and *q* are successive elements in a chain of neurograms linking *A* to *Z* and formed by reasoning about the 'real' world. To mark the strict localisation of neural excitement we here use small letters, *p* and *q*, for neurograms of 'particular partial aspects' or 'essences'—extracted abstract characters—such as are always used in reasoning.⁴ The essences themselves, or the facts⁵ from which they are abstracted, are denoted by letters in Roman type (*p*, *q*, *A*),

¹ *Pragmatism*.

³ See above, p. 170.

⁵ See below, p. 197.

² *Gifford Lectures*, Vol. I, p. 7.

⁴ See above, p. 175.

while the same letter in black type (**p**, **q**, **A**) stands for any thought about them.¹

Then we have said that the link between *p* and *q* must correspond to a 'real' fact; and that there are such facts in the world of our experience. Thus the essences *p* and *q*—say, mammal and carnivor—in the world of experience 'involve or imply each other. One of them is a sign to us that the other will be found. They hunt in couples, as it were.'² And the world we live in does present a number of abstract characters or essences which, like mammal and carnivor, affect constant habits of mutual concomitance or repugnance. In our world such a proposition as that a carnivor is also a mammal (or that what is *p* is also *q*), if it prove to be true in one instance, may very likely be true in every other instance we meet. 'This is, in fact, a world in which general laws obtain, in which universal propositions *are* true, and in which reasoning is therefore possible.'³

¹ See above, pp. 93-94.

² W. James, *Principles of Psychology*, Vol. II, p. 337. Cf also Poincaré (*Science and Method*, p. 17): 'The most interesting facts are those which can be used several times, those which have a chance of recurring. We have been fortunate enough to be born in a world where there are such facts. Suppose that instead of eighty chemical elements we had eighty millions, and that they were not some common and others rare, but uniformly distributed. Then each time we picked up a new pebble there would be a strong probability that it was composed of some unknown substance. Nothing that we knew of other pebbles would tell us anything about it. Before each new object we should be like a new-born child; like him we could but obey our caprices or our necessities. In such a world there would be no science, perhaps thought and even life would be impossible, since evolution could not have developed the instincts of self-preservation. Providentially it is not so; but this blessing, like all those to which we are accustomed, is not appreciated at its true value. The biologist would be equally embarrassed if there were only individuals and no species, and if heredity did not make children resemble their parents.'

³ W. James, *loc. cit.* Vol. II, p. 337.

The essences or abstract characters best known to 'hunt in couples' are those defined by natural science, such as mammal and carnivor, mass and weight, action and reaction. Their habits of mutual concomitance or repugnance may be expressed as particular facts ('a carnivor is a mammal') or general laws ('action and re-action are equal and opposite'). Again, those facts and laws which best fit experience and are therefore most true have been taught us by natural science. These so-called 'scientific facts' and 'laws of Nature' summarise human experience of our world *in carefully defined terms*. They do not deal directly with things as wholes, with concrete things, but with extracted characters, essences, or abstracts. The concrete things of our experience are far too complex, and our ordinary unscientific thoughts of them far too vague, for us to be able to make true general statements about their relations to one another. So we cannot reason about them. For successful reasoning we must concentrate excitement in some definite part of the system of neurograms to which excitement tends to spread during the reasoning process.

In the world of our experience we have noticed general characters, facts, laws, concrete things, essences and abstracts. We may simplify our account by defining our terms.

A *thing* is, for us, any part of the real world. We assume in this definition that the world of our experience is a reality outside our thought. We use the word *fact* to describe a thing as it is generally assumed and defined to be after verifying that the fact fits all available experience of the thing. It is now, for example, a fact that solid matter is not what it seems but made up of electrical charges floating in extreme

emptiness.¹ An *essence* is such a particular partial aspect of a fact as can only be thought of as a whole or not at all: an all-or-none fact of the world of experience.²

We thus distinguish between *things* in the real world and *facts* (or essences) of our experience, and so avoid assuming the identity of things in themselves with the facts that we know. The identity may exist, but we need not take it for granted. The world of things behaves as if it were identical with the world of facts as we have defined them: they fit experience and are therefore 'true'. Everything is as if our facts were indistinguishable from the real things they stand for. And so soon as some new experience does not fit the facts, they are replaced by new ones that fit *all* available experience. For example, the fact or law of gravitation laid down by Newton was replaced by a new and slightly different fact when astronomers verified that, as Einstein had predicted, the sun bends the path of a ray of light passing near it.

Since a 'thing' may be any part or perhaps the whole of the real world, a 'fact' may be any part, however complex or however simple, of the world of experience. But the fact includes whatever always accompanies it.³ For example, the 'fact' of silver includes all the properties of silver although many of them may also be properties of gold; but the 'essence'

¹ 'The atom is as porous as the solar system. If we eliminated all the unfilled space in a man's body and collected all his protons and electrons into one mass, the man could be reduced to a speck just visible with a magnifying glass.' (*The Nature of the Physical World*, by Sir A. S. Eddington, F.R.S.: Gifford Lectures for 1937, pp. 1, 2.)

² The meaning of 'essence' thus defined will become clearer in the sequel. Meanwhile we may take as an illustration the atom of hydrogen (or any other element) as first thought of by Dalton and his followers before the break-up and the structure of atoms were studied by modern physicists.

³ See below, p. 211.

of silver is something that belongs to silver alone. The whole world of experience is thus a single fact. So also is every subdivision of it down to the *simple fact* which consists of an essence (e.g. of silver), with whatever other essences (e.g. of metal) always accompany it in the world of experience.

A fact, we said, is something definite: 'a thing as it is... defined to be.' Exact or scientific knowledge is concerned with such definite portions of the world of experience. Facts, preferably simple facts and essences, are the material with which such knowledge works. The point and line, for example, about which Euclid reasoned are not the point and line of everyday life. We have no direct experience of a point without magnitude or of a line without breadth. But, in order to establish true universal propositions through geometrical reasoning, we extract the essence of position from the point as we know it and the essence of direction from the line as we know it. We define the point or line as being, for the purpose of geometry, equivalent to these essences or simple general characters; and we deal only with the abstracts thus defined. In the same way, the gold that concerns the chemist is not the gold vaguely known to the man in the street, the measure, as he is prone to think, both of men's work and of God's gifts. It is the abstracted character, the element Au, distinguished by its chemical properties, or by the pink colour of gold vapour or of gold ruby glass, or by the green translucence of gold leaf, as well as by the yellow sheen of a wedding ring or a minted sovereign.

Thus the expert works with facts that are at once definite and more simple than those of everyday life, even though they may still be as complex as the chemist's gold, with all its mechanical and physical as well as chemical properties.

When, however, we abstract facts and essences from our experience, and define them,¹ we are not losing touch with reality. They themselves fit experience, and so also do the conclusions reached in reasoning about them.

§ 2. THE REALM OF FACTS

The definite facts known to science—not only natural science but every branch of exact knowledge—are no mere jumble of equally significant or insignificant items. On the contrary, each has its proper place in an orderly system of relationships. ‘Scientists believe’, says Poincaré, ‘that there is a hierarchy’ or, as we shall see, endarchy ‘of facts’.² For if all facts and all essences were equally significant, important, or valuable, we should know less and less of the real world. As Poincaré points out, ‘however great our activity, facts outstrip us, and we can never overtake them; while the scientist is discovering one fact, millions and millions are produced in every cubic inch of his body’.³ But since the facts and essences used by science are not all equally significant, we may select and get to know those that matter most, and so gain true knowledge of growing value, even though we continue to ignore trifles.

If we enquire what precisely is meant by one essence, *p*, being more significant, important or valuable than another, *q*, to any of us *personally*, we shall find that the neurogram, *p*, of the first is deeper than that, *q*, of the second: so that, during involuntary thinking, *p* is more likely to be excited

¹ This definition will sometimes involve the invention of a new word which, as Poincaré says (*Science and Method*, p. 28), will often be sufficient to bring out the newly discovered relation and the word will be creative.

² *Loc. cit.* p. 16; and see above, p. 178.

³ *Loc. cit.* p. 16. For Poincaré’s purpose it was unnecessary to distinguish between a *fact* and the *thing* it represents.

than q , other things being equal. It may be that p occurs more often than q in the world of our personal experience; or p may be linked up with affective elements more closely than q . But in any case p is more often thought of than q . The most valuable facts for each of us are those of which we think most often.

The order of value of the *essences* that have been abstracted, named and defined in any branch of knowledge is much the same for each of its students. Many *facts* also have 'objective' values of their own: values that do not depend wholly or mainly on the person who estimates them. For example, every student of mechanics would regard Newton's laws of motion and his law of gravity as more significant or valuable than Kepler's laws of planetary orbits. The former are more often used than the latter. Indeed the latter may be deduced from the former, although historically Kepler's laws preceded those of Newton. Thus the facts of science have much the same order of value for all their students; and there is an order belonging to the facts themselves, or at least to the essences into which they may be analysed. It is independent of the order of their value to any particular person. The 'objective' *value of an essence* depends upon how often it occurs in the world of experience and so upon the use that can be made of it.

The essences, and the facts made up of them, have to be altered from time to time to fit new experience. If we could imagine an omniscient being with a brain on the human model, he would know the world that now is by means of facts and essences. But his facts and essences would never need changing, except to keep pace with the evolution of the real world itself. They would be the last word: *ultimate*

facts and *ultimate* essences, organised and inter-connected. They would constitute Professor Whitehead's 'neat, trim, tidy, exact world which is the goal of scientific thought'.¹ And their order would be that implied by Poincaré when he speaks of scientists believing that there is a hierarchy of facts.

We shall find that this 'goal of scientific thought', this 'hierarchy of facts', has the form of an endarchy. We may call it the 'endarchy of knowledge'. It is made up of ultimate facts since they alone form a single endarchy. It is a mode of conceiving our world; a mode which fits experience, enabling future events to be foretold;² and a mode which is therefore true. But we can no more be sure that it is true *absolutely*—that the endarchy we are going to describe belongs to things in themselves as well as to the facts we find out about them—than we can be sure of absolute truth in any other connexion.

§ 3. THE GROWTH OF KNOWLEDGE

The goal of scientific thought has not yet been reached. Many of the facts we know are far from being ultimate. The realm of facts has still to become an endarchy. Although the endarchy will only come into being as scientific thought gradually builds it up, we may describe this process as discovery.³ Already several separate endarchies have been

¹ *The Organisation of Thought*, p. 110.

² E.g. the provisional or approximate facts used in compiling the *Nautical Almanac* are already complete enough to allow many astronomical events to be foretold two years ahead.

³ Of course, it *may* exist before and so be truly 'discovered'. Kepler thought so when, after having discovered the laws which bear his name, he prayed: 'We think Thy thoughts after Thee, O God.' But compare W. James: '*classification and conception are purely teleological weapons of the mind.*' (*Loc. cit.* Vol. II, p. 335.)

formed by discoveries in particular branches of knowledge; and these from time to time become linked together, as when Rutherford and Soddy showed that the chemists' atom had a structure for physicists to investigate, or Moseley went on to prove that the earlier empirical classification of chemical elements depended on the physical constitution of their atoms. So we conceive of the endarchy of ultimate facts as a single whole formed by uniting the separate endarchies created by particular branches of knowledge: history, say, or theology no less than natural science.

'Scientific discovery', writes Eddington, 'is like the fitting together of the pieces of a great jig-saw puzzle.... One day you ask the scientist how he is getting on; he replies, "Finely. I have very nearly finished this piece of blue sky". Another day you ask how the sky is progressing and are told, "I have added a lot more, but it was sea, not sky; there's a boat floating on the top of it". Perhaps next time it will turn out to be a parasol upside down; but our friend is still enthusiastically delighted with the progress he is making. The scientist has his guesses as to how the finished picture will work out; he depends on these in his search for other pieces to fit; but his guesses are modified from time to time by unexpected developments as the fitting proceeds. These revolutions of thought as to the final picture do not cause the scientist to lose faith in his handiwork, for he is aware that the completed portion is growing all the time.... Amid all our faulty attempts at expression the kernel of scientific truth steadily grows; and of this truth it may be said—The more it changes, the more it remains the same thing.'¹

The first stage in the advance of scientific thought towards its goal consists in abstracting and naming particular partial aspects of concrete facts. These abstract facts are, at this stage,

¹ *The Nature of the Physical World*, pp. 352-353.

indistinguishable from essences since each of them can only be thought of as a whole or not at all. While they are more simple than the concretes, they are also more general.¹ For example, when we abstract the essence 'carnivor' from our experience of dogs, cats and other flesh-eating animals, it is more general than any of these animals because it occurs more often in the world of experience.

Analysis is thus the chief feature of this first stage. It is achieved by thinking of our experience of whole concrete things, such as the carnivorous animals, all of which have the same particular partial aspect combined with different non-essential elements.

Synthesis begins with the second stage. A new essence is then abstracted from, and thereafter links together, each of a group of characters abstracted in the first stage. For example, the essence 'mammal' may be abstracted from 'carnivors' and 'ungulates' and thereafter link them together. This linking is something intimate and permanent. The essences thus connected are among those that 'hunt in couples'.² Suppose, for example, that in the dawn of scientific thought, men's experience had made them familiar with trees of various sorts and with other wooden objects like staves and clubs and bows and arrows. Their first step towards exact knowledge would be to abstract, and to name, these particular partial aspects of their total experience. The next step might be to abstract from each of these particular facts, and to name,³ their common essence, 'wood', a particular partial

¹ Cf. W. James: 'the extracted characters are more general than the concretes.' (*Loc. cit.* Vol. II, p. 342.)

² See above, p. 196.

³ Cf. Poincaré: 'Mathematics is the art of giving the same name to different things' (*loc. cit.* p. 34), and so uniting them.

aspect of each. The new essence belongs—and this is true not only in our example but in every other case as well—to all the first-stage facts¹ and so unites them. It is more *general* than any of them. It occurs more often in the world of experience, and is therefore more *valuable*.² And, since it is part and only part of each of the first-stage facts, it is also more *simple* than they are.

After the second stage in the growth of knowledge, the endarchy that has begun to form resembles the diagram overleaf, where the upper line stands for the essence abstracted in the second stage from facts represented by the upper line together with one of the lower lines, a different one for each fact. All these facts were essences until the second stage split each of them into two essences shown by the upper and one or other of the lower lines. The upper line together with all the lower ones represents a partial endarchy, a part of the whole realm of facts.

At every subsequent stage of progress towards the goal of scientific thought, new essences are abstracted from the facts already abstracted from the world of experience. Each of these new essences adds to the synthesis in the manner already described. It links up previously existing essences with partial endarchies or partial endarchies with one another.

¹ Each of these first-stage facts was an 'essence' (see p. 198) until it was analysed in this second stage. It ceased to be an essence so soon as analysis revealed the new essence—'wood'—as part of it. 'Wood' in turn ceases to be an essence and becomes a 'simple fact' (see p. 211) when further analysis separates the next essence from it. See next paragraph of text.

² Cf. Poincaré: 'If a new result is to have any value, it must unite elements long since known, but till then scattered and seemingly foreign to each other, and suddenly introduce order where the appearance of disorder reigned.' (*Loc. cit.* p. 30.)

So the endarchy of knowledge goes on growing until every essence is linked to every other, and every pair of facts are connected by the essences common to both. When at last the goal of scientific thought is reached, the whole knowable universe is thus organised and united.

Progress towards the goal of scientific thought is conditioned in two ways by the use to be made of ordered knowledge. The first condition is that no essence shall directly unite more than a strictly limited number of others.

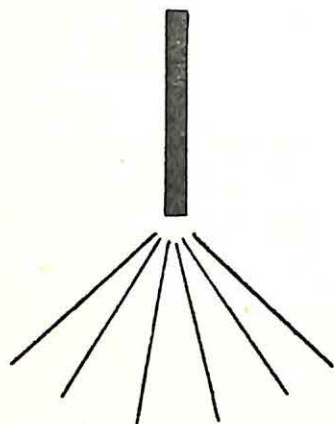


FIG. 6

And the second condition is that there shall be only one direct path—only one path that does not turn back upon itself and so go over the same ground more than once—from any one essence to any other.

The first condition is seen at work when the number of varieties in any botanical or zoological species becomes inconveniently large. They are then grouped into separate sub-species. Thus the number of sub-species belonging to (or 'directly united by' or 'derived from') a single species is kept within the limit; and so also is the number of varieties

belonging to (or 'derived from') a single sub-species. The same is true of every scientific organisation: of telephone exchanges, for example, or even of men. The subscribers whose private lines are brought together in a single exchange must not exceed a certain number: in London it is ten thousand. And the number of men in an army determines the number of grades of officers needed to command them so that no one officer shall have more than a strictly limited number of officers or men directly under him. A national army of millions needs more grades of officers than a city police force, and the Royal Navy than a merchant fleet.¹ Indeed, a great army that possessed only a commander-in-chief without subordinate officers or N.C.O.'s would not be an orderly force at all, but merely a rabble. And an essence directly uniting a very large number of other essences might as well have never been abstracted from them for any use it or they would be in reasoning.² The diagram (Fig. 7) represents the central portion of an endarchy when every essence,

¹ Another example is the fact that the large main group of flesh-eating placental mammals is described as an 'order' while the much smaller main group of flesh-eating marsupial mammals is not. But there is much to be said for sub-dividing marsupials into the same grades as placental mammals, even though so many grades are not needed for marsupials alone.

² If, for example, in Fig. 5 on p. 170 the number of neurograms (b' , b'' , ...) directly connected with a' had been very great, the chance of selecting the right one, b' , for the purpose of reasoning out the new path $Aa'b' \dots z'Z$ would have been so small as to be negligible and the new path would have ceased with a' . In W. James' words: 'My thinking is first and last and always for the sake of my doing, and I can only do one thing at a time. A God, who is supposed to drive the whole universe abreast, may also be supposed, without detriment to his activity, to see all parts of it at once and without emphasis. But were our human attention so to disperse itself we should simply stare vacantly at things at large and forfeit our opportunity of doing any particular act.' (*Loc. cit.* Vol. II, p. 333.)

or line-element in the drawing, has two and only two others directly derived from it. In practice, of course, the maximum

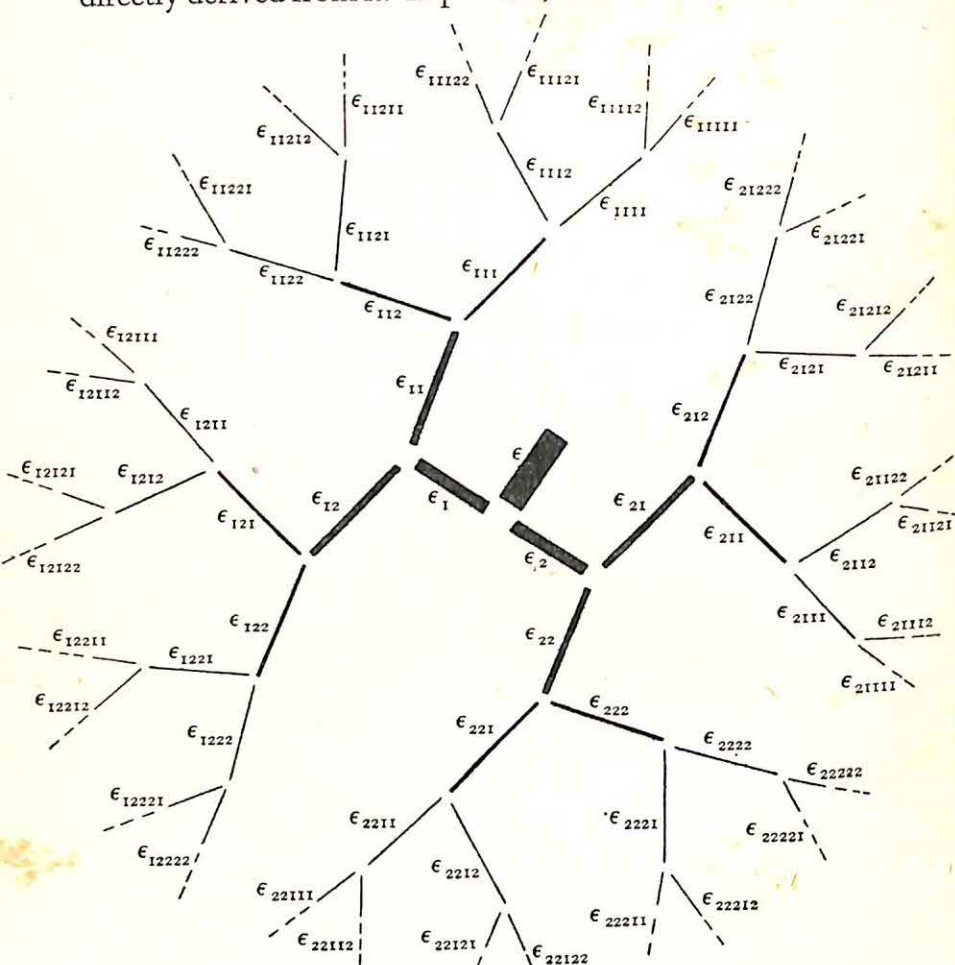


FIG. 7

number required by our first condition would be far greater than two.

The second condition—that there shall be one and only one direct path from any one essence to any other in the

endarchy of knowledge—is also illustrated in the diagram; for it shows only one path, made up of a string of directly connected end-on line-elements, going from any one element to any other without traversing any element more than once. This condition can be seen at work in those branches of knowledge which are most perfectly organised. For example, plane geometry, as formerly studied under the name of Euclid, was highly organised so far as it went. There was only one proof of many of the theorems and only one correct solution of many of the problems. The same is true in a less degree of other more imperfect branches of mathematics. Scientific thought aims at making this condition apply throughout the realm of facts.¹

§ 4. SUBDIVISIONS OF KNOWLEDGE

In a vast diagram resembling Fig. 7 but drawn to represent all knowledge—the organised body of ultimate facts—each line-element would stand for an ultimate essence.² The *value*

¹ Another example of the operation of the second condition is furnished by zoological classification. The placental mammal having been separated from other groups (classes and sub-classes) of animals and having been sub-divided into sub-groups (orders), one of which had been named from its carnivorous habits, other flesh-eating animals, which were not placental mammals at all but marsupials, were discovered in Australia. If these flesh-eating marsupials were to be called 'carnivores' it would be possible to proceed from the element 'placental mammal' in the zoological (partial) endarchy to the element 'marsupial mammal' by two different paths: an upper path through the element 'mammal' from which both placental and marsupial mammal are derived, and a lower path through 'carnivor', an element that would, under these circumstances, be derived both from placental and from marsupial mammal. Our second condition would then be infringed. In order therefore to satisfy our second condition, the main group of flesh-eating marsupials was described as 'sarcophaga' instead of as 'carnivora'. And, in general, Greek instead of Latin words were used to name sub-groups of marsupials.

² In this and the next paragraph, all facts and essences are 'ultimate' unless the contrary is stated.

of each essence would be marked in the diagram, as in Fig. 7, by the width of the line-element representing it, and the widest lines would be those nearest to the centre. We have already¹ spoken of one essence as more 'valuable' than another because it occurs more often in the world of experience; and the essences represented by line-elements near the centre of our diagram belong to many more facts and so occur far more frequently than those represented by lines in the outer zones. And, just as the most valuable facts or essences for each of us personally are those of which we think most often,² so the omniscient being imagined on p. 201 above, whose neurograms we suppose to correspond to the whole of knowledge when the goal of scientific thought has been reached, would think most often of the essences belonging to the innermost zones, and find them most valuable. His neurograms of these essences would therefore be deepest. They would have most influence on the flow of excitement in any part of his neurography; and the flow would always be towards the centre. His neurography would therefore have the form of an endarchy.³ Since each of the neurograms that make up this endarchy corresponds to an ultimate essence (and so also to a line-element in our diagram, the deepest neurograms to the widest lines) we may speak of ultimate essences as forming an endarchy. This is the 'endarchy of knowledge'. Its most valuable essences are nearest to its centre. Each of them occurs more frequently than any that is directly or indirectly 'derived from' it; and, in general, the value of an essence increases with every addition to the number of essences it 'unites'.⁴

¹ See above, p. 201.

³ See above, p. 178.

² See above, p. 201.

⁴ See above, p. 206.

The string of end-on line-elements beginning from any one of them and ending with the central element of the diagram would stand for a *simple fact*,¹ so that any simple fact is united to any other by the central essence and by any other essences common to both. Since knowledge has grown by abstracting from concrete facts of direct experience, the essences represented by the outermost ring of line-elements in the diagram will be all that remain to distinguish one whole concrete fact from another. The simple fact represented by one of these outer-ring line-elements and the string of others joining it to the central element would be a *simple fact of direct experience*. All other simple facts would be abstract. And since a *fact*, whether simple or complex, concrete or abstract, includes so much of the world of experience as invariably accompanies it,² it would be represented by a continuous portion of the diagram always comprising the centre.

Another subdivision of knowledge, while it is still growing, is unhappily called a 'subject'. Perhaps the name will serve as a reminder that the more we restrict our study to one 'subject' in isolation from others, the less 'objective' our knowledge of it is likely to be. We must always be ready for a bit of sky to turn into a bit of sea in Eddington's jigsaw,³ for there is no separation of subjects when knowledge is complete. But before scientific thought has reached its goal, and while the central essences of the facts so far known remain undiscovered, many of these facts have as yet no connexion with one another. Others are linked together by the most abstract of their hitherto discovered essences.

¹ See above, p. 199.

² See above, p. 198.

³ See above, p. 203.

Each of these groups of facts may be studied as an isolated branch of knowledge, a separate subject. A 'subject' is thus a portion of the world of experience *as known* and studied before scientific thought has reached its goal.

A subject includes many facts, simple and complex. The complete discovery of any one of them would involve the abstraction of all its central essences. They would link the subject up with the centre of the endarchy of knowledge and so with every other ultimate fact or essence. Meanwhile the multiplication of professorial chairs, readerships and lectureships concerned with separate subjects, while it has brought about great progress in many branches of knowledge, has tended to obscure the unity of all knowledge. As we multiply specialists and experts, we should not forget the need for scientific philosophers whose concern is with knowledge as a whole.¹ They are the modern counterparts of the Whewells and the Jowetts² who, in an earlier age, took all valuable knowledge for their province.

§ 5. THOUGHT AND REALITY

Our account of the organisation of thought and of the goal it aims at may fitly end with a reminder. It is not the things themselves that we break up into essences and arrange or connect together in an endarchy, or the beginnings of one. It is rather our thoughts of these things, and the neurograms excited when we think of them, that are so treated. Yet we

¹ Cf. Sir Halford Mackinder: 'Surely there can be specialism in synthesis!' (*Proc. R. Phil. Soc. Glasgow*, Vol. LXIII, p. 181.)

² Cf. Dean Beeching's Balliol Rhyme about Jowett (1880):

First come I. My name is Jowett.
There's no knowledge but I know it.
I am Master of this College,
What I don't know isn't knowledge.

must not imagine that it is only our thoughts that we can alter or arrange. We can and do alter the real things themselves. Our business is not merely to know the world but to shape it to our ends; and even, it may be, to help God with creation. Our own neurograms are part of the world. We alter them as we organise our thought. Or again, we alter the world when we discover, for example, a new dyestuff and so enrich the general character of colour by adding to its 'value' as we increase the number of essences it unites.¹ But, when all is said, it is not the real world so much as our thoughts of it, and the neurograms excited as these thoughts pass through our minds, that we alter and link together as we gradually build up the endarchy of knowledge for the purpose of economising effort² and making reasoned thought less difficult.

This organisation of facts fits experience and is therefore true. Why the universe, as we know it, fits into this conceptual scheme is another question. Perhaps the answer is to be found in the constitution of the human brain which best plays its part in thinking when the facts thought of fit into such an endarchy as we have described. As Poincaré says, such facts are selected for our attention. Meanwhile, our reasoned thought is perhaps ignoring other aspects of the universe.

We now turn from the objective to the subjective aspects of the organisation of thought. As we pass from the dis-

¹ See above, p. 206.

² It may be shown that such an endarchy as would be represented by the diagram imagined on p. 209 above links every essence to every other by means of a minimum number of intermediate essences; and also that effort spent in organising thought according to this plan is more economical than the same effect spent in creating several separate organisations on the same model.

cussion of thought in general to that of your thought or my thought in particular—your knowledge or mine instead of what there is for us to know—the teleological character of the endarchy of facts will become clearer. Every one of these facts is or has been part of somebody's thought; and we shall soon see that the thought of each of us tends to become organised so as to suit our purposes.¹ Indeed, 'The conceptual scheme is a sort of sieve in which we try to gather up the world's contents. . . . *This whole function of conceiving, of fixing, and holding fast to meanings, has no significance apart from the fact that the conceiver is a creature with partial purposes and private ends.*'²

¹ See below, Chapter II, § 1.

² W. James, *loc. cit.* Vol. I, p. 482. The whole passage is very relevant.

CHAPTER 11

SINGLE WIDE INTERESTS

§ 1. GENERAL FEATURES

THE most obvious aspect of the field of actual experience is its disorderly character.¹ But the actual experience of each of us is made more orderly by the general organisation of thought as it advances towards its goal in the manner outlined in the last chapter. Among the items of my experience or of yours is the hearing or reading of other people's thoughts about the world. Part of our experience thus depends directly upon the general state of knowledge. Much if not all of the rest of our experience depends indirectly upon the organisation of thought in general; for each incoming sense-impression tends to awaken memories, particularly of words in which to describe it. That is to say, we tend to interpret new experience in the light of our existing knowledge; and that knowledge, in so far as we remember aright the facts that we have learned, is part of the scientific thought, the organised thought, at the time.

Indeed, the more we know of the realm of facts, the more orderly will be the neural records of our actual experience. That our neurographies do tend to correspond to the realm of facts, or to parts of it, is so important that we must insist further upon it.

Every new fact has not only to be discovered, but must also be generally accepted² as consistent with existing know-

¹ Whitehead, *The Organisation of Thought*, p. 110.

² See above, p. 197.

ledge: it must fit experience. The thought of the discoverer must be repeated, in essentials, by those who accept his discovery, and afterwards by other students. Thus the neurogram of each of them for the new fact will be linked up in much the same way with his neurograms for the old knowledge they all share. And so the neurographies of students tend to copy the realm of facts, or parts of it, as it gradually becomes the endarchy of knowledge.

So also, in a less degree, do the neurographies of ordinary men and women. As boys and girls they learn, in school and out, what most people believe to be true: for example that the earth is a tiny planet of a middle-sized star, and perhaps also that 'In the beginning God created the heaven and the earth'. Everybody's neurography thus tends to correspond in part to the realm of facts, although other parts of it may record hypotheses concerning the central essences of knowledge, or unreasoned views on all sorts of subjects,¹ as well as the evidence of one's own senses.

This tendency is increased by the instinct of curiosity. When, in the next chapter, we come to study how curiosity works, we shall find that this instinct tends to build in each of us a single endarchy of neurograms² that corresponds in part to the realm of facts.

It is good for each of us and for our society that our neurographies should correspond as nearly as possible to the realm of facts. Complete correspondence is out of the question. No one mind can know all that is now known. Still less feasible is it for any neurography to correspond to the whole endarchy of knowledge. And yet the more nearly a man's neurography corresponds to that part of the

¹ See above, p. 193.

² See below, pp. 238-42.

realm of facts with which his work is most concerned, the better, in general, will his work be done. When he meets a difficulty, his reasoning about it is more likely to lead to its removal, the more fully acquainted he is with the relevant facts. And, when the difficulty is so great that he cannot surmount it without the help of others, he will have the best chance of persuading them to follow his reasoning and to accept his conclusions if his own thought does not run counter to accepted facts. Sometimes, however, the lonely thinker who disputes an accepted fact may be nearer the truth than those who affirm it. His neurography then corresponds, in this particular, more closely than theirs to the ultimate endarchy of knowledge.

The tendency of curiosity to build a single endarchy of neurograms is not confined to those neurograms which correspond to the realm of facts as generally accepted at the time. On the contrary, it seeks to link up, or integrate, the whole neurography. A neurography thus integrated into a single system of neurograms will correspond most closely with the realm of facts if some hypothesis concerning their central undiscovered essences—essences that will eventually link all the ultimate facts together in the endarchy of knowledge—is represented in the neurography along with the provisional facts of to-day. Such an endarchy of neurograms, corresponding as nearly as possible not only with the facts so far discovered but also with the endarchy of knowledge, is, as we are about to see, good for its possessor and for the society in which he lives.

In the first place, it tends to prevent conflict between rival interest-systems. Such systems, as we saw,¹ form each

¹ See above, p. 178.

its own endarchy while having outlying elements in common. This cannot happen to the man all of whose interest-systems are integrated in a single endarchy; for the components of an endarchy are linked together by their central, not their outer, elements.

Again, the more nearly anyone's neurography resembles a single endarchy, the more consistent, and therefore effective, his conduct is likely to be. Action, as we shall see,¹ forms the natural end of every train of thought. When the excited neurograms form part of an endarchy, the excitement tends to spread towards the central elements. These are the central neurograms of the whole neurography when that is organised as a single endarchy. Their excitement will therefore accompany and so influence the final act.² Every considered action by a man with such a neurography, every one of his movements that is neither reflex nor habitual, will thus have something of the same about it. It will bear his individual hall-mark. And, if his endarchy of neurograms corresponds as closely as possible to the endarchy of knowledge, the special part of him that stamps his mark on all he does is his interest in the undiscovered truths at the centre of the endarchy of knowledge: in a word, his philosophy. Such an interest is much concerned with the future; and we have already seen how a wide and deep interest in the future will shape a man's purposes and powerfully influence all his thought and conduct.³ This steady influence helps him to work with distant objects in view. It must make for consistent behaviour and long-range achievement.⁴

¹ On p. 260 below.

² See below, p. 268.

³ See above, p. 167; also below, Chapter 15.

⁴ Cf. our account of the factor *w* on pp. 142 and 149 above.

Still another advantage of a neurography that corresponds as closely as possible to the endarchy of knowledge is that it makes for efficient reasoning.¹ I shall find it easier to work out the true relation between two facts the more I know of it already; for I need only complete so much of the true² path between my corresponding neurograms as does not already exist in my neurography. The more nearly, therefore, the elements of my neurography correspond to the essences of the endarchy of knowledge, the less trouble will I have in reasoning out the true relation of any two facts to one another. It is indeed a function of reasoned thought, not merely to solve a problem or resolve a conflict for the time being, but to leave a neurographic path that will prevent the issue from causing further trouble.

A neurography such as we have been discussing also makes for sound judgment in matters that lie outside the realm of ascertained and accepted facts. While the researcher, the specialist and the expert have to reason chiefly about a particular branch of knowledge, the man of affairs—whether statesman, politician, business man, or anybody in his capacity

¹ It can be shown that if, in the diagram imagined on p. 209 above, resembling but extending Fig. 7 on p. 208, the number of line-elements directly united by an element in the next most central ring is always equal to the maximum number mentioned in the first condition laid down on p. 206, then the average number of line-elements linking any one to any other is a minimum. The same arrangement of neurogram elements yields the minimum average path between one element and another. It results in the shortest trains of reasoning. And since efficient reasoning about the world of experience is a main purpose of the organisation of thought, we may regard the endarchy of knowledge as having this further property: that the number of essences directly derived from an essence of the next most inner ring is always the same. A system of neurograms that corresponds as nearly as possible to the endarchy of knowledge will then make for reasoning that is efficient as well as valid.

See above, p. 195.

of citizen—has to think about matters beyond the present frontiers of the realm of facts. He has to deal with 'values which are not wholly amenable to scientific analysis'.¹ The typical phrases of his judgments will be 'on the whole' and 'all things considered'. A system of neurograms that corresponds as nearly as may be to the endarchy of knowledge as a whole may help its possessor to bring the method of science to bear upon the framing of sound judgments concerning the urgent daily business of the world.

Once more, a neurography of the same pattern as before makes for freedom of action. No man can perform any voluntary act unless he first thinks of it. An endarchy of neurograms that yields the shortest average path from any one to any other will, in general, also offer the least resistance from the neurogram excited at any stage of reasoned thought to the neurograms of a possible course of action. The possessor of such an endarchy of neurograms will therefore have, other things being equal, the greatest freedom of action from moment to moment. He will have the fullest opportunity to choose his course through life and to achieve his purpose, whatever that may be. But other things will not be equal unless his endarchy of neurograms corresponds more closely with those parts of the realm of facts with which his work is most concerned than with other parts equally far removed from the centre of the endarchy of knowledge. Hence the need for each pupil's education to include some study of the most valuable facts and principles governing the practice of his life's work, so far as that can be foreseen. And, since it will be part of every democrat's duty to take part in governing the community or communities to which

¹ Sir Halford Mackinder, *Proc. R. Phil. Soc. Glasgow*, Vol. LXIII, p. 181.

he belongs, his education should be wide enough to include some scientific study of local, national and world affairs.

On the other hand, the study of different branches of knowledge as entirely separate subjects is to be avoided. It impairs soundness of judgment and lessens the efficiency of reasoning outside the water-tight compartments. That the realm of facts, like the former Kingdom of Prussia, has been built up in isolated morsels is no answer to this contention; but it is a reason why the heuristic method of education¹ should not be carried too far.

There is one more weighty reason why as much of the neurography as possible should form an endarchy. When we have looked more deeply into the central elements of the endarchy which we shall then regard as best for the individual and for the community, we shall find that they include those corresponding to the self and the self-regarding sentiment.² These elements therefore tend to become excited from any part of the endarchy. Thus the Will is able to intervene with the greatest effect³ when the neurography has this form. We shall describe such a neurography as a single wide interest-system.⁴

In this section we have noticed a number of reasons why it is good for men and women and for the communities they live in that their neurographies should correspond, in part at least, to the realm of facts and even to the endarchy of knowledge so far as that is possible. We have also observed that neurographies tend to include elements corresponding to the

¹ Whereby the pupil is encouraged to repeat for himself the experiments by which the facts he is studying were originally discovered.

² See below, p. 233; and p. 77 above.

³ See above, p. 147.

⁴ See below, p. 236.

realm of facts¹ and also to take the form of an endarchy.² But the very existence of these tendencies suggests that the endarchy of knowledge may owe its shape to its discoverers: the thinkers and observers who have gradually created it in their own image. If so, they have acted, in part, involuntarily because of the way curiosity works; and, in any case, this organisation of their thought has made for efficient reasoning, freedom of action, consistent behaviour, immunity from conflict, increased power of Will, and perhaps also sound judgment in matters lying outside the realm of ascertained facts.

§ 2. INDIVIDUAL DIFFERENCES

We resume the argument interrupted by the last paragraph. No amount of effort on the part of any person or his teachers will make his neurography correspond in detail to the ultimate endarchy of knowledge or even to the realm of known facts. The volume of his experience, all that he sees and hears and feels and does, is far too large for the whole record of his thought to be abstracted, classified, and, so to speak, filed for reference according to the system of the endarchy of knowledge. Even if, by some miracle, the whole of a man's neurography had been organised in this way, incoming nervous impulses, stimulated by the events happening in and around his body, would make new neurograms and alter old ones faster than he could reorganise them all so that old and new alike had each its proper place. Nor is it a question of the neurography alone being too large: the realm of facts is also too large for correspondence to be complete. There are subjects of which the ordinary man is

¹ See above, p. 216.

² See above, p. 217.

completely ignorant. None of their essences will be represented in his neurography. There are other subjects of which he knows something. His neurography will include elements corresponding to some, but hardly to all, the known essences of these subjects unless he has made them his own.

Yet much can be done to build up the kind of neurography we have seen to be good for the community and for every member of it. A pupil and his teachers are not at the mercy of chance for all that befalls him. They can choose experiences to be added by design to those brought by luck. They may decide what subjects he shall study, what books he shall read, what experiments he shall try, what crafts he shall practise, what physical training he shall undergo, and, up to a point, how he shall behave. They (but chiefly the pupil) have some control over his feelings for each new fact as it comes to his notice, so that they can influence the depth of his neurograms and the growth of his sentiments; and this control, such as it is, is not confined to his formal education. Above all, they (but chiefly his teachers to begin with) can see to it that all his formal studies are thought of as parts of one whole, as means to the same end, and that end the knowledge and service of God.¹ Indeed, this first step in the integration of thought can begin in the nursery, where every new event may well be treated as an act of God until this account of it can be amplified by showing how the new fact is linked up with facts that the child already knows.

The central elements of the growing neurography are to represent, as we saw, a hypothesis concerning the central essences of the endarchy of knowledge. We shall see how they may also form the foundations of character.

¹ This definition of the end is justified on p. 233 below.

Next to them in value and importance come the neurograms that are to be used by the pupil in his reasoning, especially about his work—vocational, social and political. They need to correspond most closely to those regions of the realm of facts with which his work is most concerned.¹ This system of neurograms we shall call his 'work-system'. It is excited whenever he thinks of any aspect of his work: the work by which he serves his fellows and for which he hopes perhaps to be remembered. This work-system is, as we shall see, closely linked up with affective neurograms, so that it and they together form an interest-system.²

The work-systems of different persons will differ according to their different occupations. Skilled manual workers need work-systems that include a large proportion of neurograms excited by practical experience and corresponding to the outer-zone essences of the realm of facts. The work-systems of abstract thinkers, on the other hand, will be richer in elements that correspond to inner essences. Experts in particular branches of knowledge will have work-systems that answer to the facts and essences so far discovered in their own subjects. The work-systems of philosophers and theologians will include neurograms corresponding as nearly as possible to the central essences of the endarchy of knowledge.

We observe that abstract facts or essences should not be represented in any man's work-system without some concrete basis, some concrete fact of which they form part. That

¹ So that, if an element, *E'*, of this part of his neurography corresponds to an essence, *E*, of the realm of facts, we can be sure that *E'* does not correspond to any essence *instead* of *E*, although *E'* may correspond to many essences *in addition to* *E*. Cf. W. James, *loc. cit.* Vol. I, p. 461. We have here written *E'* instead of *E* so as to mark the possible imperfection of the correspondence between *E'* and *E*.

² See above, p. 82.

may be why the abstract fact of the Son of Man having 'power on earth to forgive sins' was promptly linked by Jesus to the concrete fact of the sick man's obeying the command to 'take up your bed and walk'. By lecturing to elementary students or to the general public, a learned professor may get a better grasp of his subject or even be led to new discoveries. And children studying geography ought to have seen at least one river before being taught how rivers are formed or learning lists of rivers in any geographical region.¹

The events of every day gradually link up the elements of a man's work-system with other neurograms outside it, the more so the wider is his work-system, because neurograms that are excited together have thereafter a bond between them. For example, the professional physicist is struck by a picture that sacrifices science to art in depicting both the sun and a rainbow, and thereafter the picture and its associations have their link with his physics. Or again, a railway engineer has his professional interests connected with his holidays abroad by the monstrous locomotives that he sees in foreign parts. And mountains, to the botanist, mean plants as well as peaks. Thus connexions are formed between one's work-system and the less organised regions of the neurography outside it. Connexions of the same kind—linking whole concrete facts to one another instead of uniting particular partial aspects of them through common essences that belong to other facts as well—are also formed between one neurogram and another when both of them lie outside the work-system.

The central elements of the neurography are, as we are

¹ See below, p. 265.

about to see, closely connected with emotions and conations. Indeed, they consist largely of affective elements. They are thus very easily linked up with neurograms outside the work-system. It is only necessary to connect any of these neurograms with certain emotion-elements¹ in order to join them to the central elements of the whole neurography. Moreover, the more permanent of these outside neurograms are likely to be rich in emotion-elements. Otherwise they would quickly disintegrate and disappear because they are not organised, used and deepened by reasoned thought.

In these ways, those parts of the neurography that lie outside the work-system, and especially the deepest or most valuable² parts, tend to get linked up with the central elements and with the work-system itself. The whole neurography thus tends to form what, for the moment, we may call a 'personal endarchy'.

An illustration from William James will help us to compare the organised work-system with the less organised neurography outside it. 'Suppose I say, when offered a piece of cloth, "I won't buy that; it looks as if it would fade", meaning merely that something about it suggests the idea of fading to my mind,—my judgment, though possibly correct, is not reasoned, but purely empirical; but, if I can say that into the colour there enters a certain dye which I know to be chemically unstable, and that *therefore* the colour will fade, my judgment is reasoned.'³

If I am a dyer by trade and if I know my business, the first thing I do on being shown the piece of cloth is to abstract

¹ I.e., neurograms of emotions.

² See above, pp. 200 and 210.

³ W. James, *loc. cit.* Vol. II, p. 340.

from it the particular partial aspect of its colour. My work-system enables me to recognise that colour as due in part—another particular partial aspect—to a certain dyestuff, and to split the fact of that dyestuff into its essences including its chemical constitution and the instability that is a common essence of all the dyestuffs in that chemical group. So I know that it will fade. By means of my work-system I have made a reasoned connexion, essence by essence, between the fact of the cloth and the fact that it will fade.

But if I know nothing, or not enough, of the chemistry of dyes, I can only make an empirical connexion between the two facts. I begin as before, abstracting from the look of the cloth the particular partial aspect of its colour. But my neurography contains nothing corresponding to the chemical constitution of the dye or to the instability of dyes in that group. The fact of the dye is represented in my neurography by a neurogram from which elements corresponding to certain essences are missing. The fact is short-circuited. The result is that I cannot tell for certain whether the dye will fade or not. But I may have had previous experience of the colour, or of another very like it, and so guess that it will fade. In that case the connexion between the fact of the cloth and the fact of its fading is of the empirical and unreliable kind that marks the less organised part of a neurography.¹

¹ Compare the empirical connexion between the handle and the spout of a pump as it exists in the unorganised neurography of the plain man:

‘Let A be the handle and B be the spout;
Pull A up and down and the water comes out’

with the reasoned connexion in the work-system of the hydraulic engineer, or of any student of hydrostatics.

If your neurography is like mine in short-circuiting the fact of the dye in this piece of cloth, it may happen that, when you see it, you will say: 'I fancy it is dyed with so-and-so, and therefore it will not fade.' You and I will then perhaps fall into a dispute which we should have avoided if both of us had known better what we were talking about. Disputes between two or more people are often due to ignorance: to the imperfect correspondence of their neurographies with the realm of facts and therefore with one another. Indeed, if we take account of affective as well as of cognitive neurograms, all disputes may be attributed to neurographic differences between the disputants. But it is affective differences that make the most and the worst quarrels. These are generally due, not to 'misunderstandings', but to incompatibility of purpose.¹

§ 3. THE CENTRAL ELEMENTS

This chapter began by looking into some features common to the neurographies of people who live together as an independent community or commonwealth. We saw how their neurographies tended to resemble the realm of facts and even the endarchy of knowledge. We examined half-a-dozen reasons why it is good for a man and for his community that his neurography should form an endarchy corresponding as nearly as possible to the endarchy of knowledge. In particular, the most central, and therefore the deepest, elements of his neurography should correspond, so far as may be, to the most central essences, although their

¹ See below, p. 231.

discovery will not be complete until the goal of scientific thought has been reached.

We went on to observe that different people have different work to do; and that, therefore, it is good for them and for their community that their neurographies should differ. Their work-systems, in particular, need to correspond to different parts of the realm of facts. The deeper neurograms in the work-system represent the more central of these regions of the realm of facts because, in reasoned thought, elements of the work-system are more often excited when they correspond to more central and more general essences, essences which occur more frequently in the facts thought about. That, however, is no reason why the deepest of all the elements in every work-system should not correspond to the most central (but as yet undiscovered) essences of the endarchy of knowledge.

But the depth of a neurogram depends on the intensity as well as on the frequency of its excitement. Neurograms excited in the working of an instinct, and so linked closely to affective elements, are likely to be especially deep. We have seen¹ that, of these neurograms, those belonging to the 'future' interest-system, and purpose-neurograms in particular, are likely to have the greatest influence on the path of excitement through the neurography. It follows that the central portion of an endarchical neurography—a 'personal endarchy'²—must be occupied by purpose-neurograms. As William James said, the classification of experience and, we may add, its record in personal endarchies of neurograms are 'purely teleological weapons of the mind'.³ Our various

¹ On pp. 165-167 above.

² See above, p. 226.

³ W. James, *loc. cit.* Vol. II, p. 335.

personal endarchies characterise us more than they characterise the real world. Different individuals, as we said, are characterised by very different personal endarchies.

If, however, the central elements of personal endarchies correspond to the *different* purposes of their possessors, how can they also correspond to the *same* central essences of the endarchy of knowledge? This difficulty would not trouble us were we concerned only with the reasoned thought of the people in our community; for the central essences of knowledge are not yet included in the realm of facts. But, since conduct is in question, the problem has to be solved.

We have not far to look for a solution. Conscious control, as we have seen,¹ affords the ideal means of deciding all conflicts. The conscious processes whereby particular desires or tendencies are brought into relation with the other dominant tendencies of the personality 'consists', according to Professor Fluegel, 'at any rate to some extent, in the logical process of subsuming the end or goal of each tendency under some higher end or goal'.² In other words, conflicts are best avoided by consciously building up an endarchy of purposes wherein every element (except the central one) is 'subsumed' under some higher or more central element. Fluegel adds:

As a result of this process the mind is able to see clearly the manner in which the particular desires and tendencies in question are related to the other interests of the personality, and these other interests are in turn brought to play upon the particular desires, in a way which is otherwise impossible. It is obvious that in such a case the process cannot logically come to an end at this point and that these higher ends must often be themselves called into question and decisions made

¹ On pp. 133 and 193 above.

² *Brit. J. Psych.* Vol. VIII (1917), p. 490.

between them. This involves the subsumption under still higher ends until we come at last to some conception of the highest good of all, the *summum bonum*. Theoretically perfect conduct on this principle would thus consist in a completely harmonious series of means to ends, all duly subordinated to the highest end of which the mind in question could conceive. It would in fact be conduct such as would be generally recognised by teleological systems of Ethics as both intellectually and morally the most desirable.

It is good for a community that its members should agree with one another on what is the *summum bonum*. Or, in Greek, they need some *ὁμόνοια* in their thought about the highest good of all. Their purposes ought to have enough in common for them to be at one on the main issue.¹ The master purpose of each should be the same.

Our problem is thus reduced to that of finding out how the central elements of different neurographies may correspond to the same *summum bonum* and also to the same central essences of the endarchy of knowledge. A solution is found in the Christian conception of God, whom to seek² and to know³ is the highest good and in whom all things consist, even as all ultimate facts are joined together by the central essence of the endarchy of knowledge.

¹ Cf. Lord Balfour: 'Our alternating Cabinets, though belonging to different parties, have never differed about the foundations of society. And it is evident that our whole political machinery presupposes a people so fundamentally at one that they can afford to bicker; and so sure of their own moderation that they are not dangerously disturbed by the never-ending din of political conflict.' (*Introduction to Walter Bagehot's English Constitution*, p. xxiv, ed. 1928.)

² 'Seek ye first his kingdom' (Matt. vi, 33). But 'The kingdom of heaven is God': see Whitehead, *Religion in the Making*, p. 138.

³ 'This life is eternal, that they should know thee the only true God, and him whom thou didst send, Jesus Christ.' (John xvii, 3.)

Here then is one hypothesis¹ that will link up the discovered essences of the realm of facts (or so many of them as are represented in the work-system of any member of our community) and form them into an endarchy corresponding as nearly as is now possible to the endarchy of knowledge. But whatever hypothesis be taken as a starting point, it will have to be tested by, and, if need be, altered to fit, further experience.² Meanwhile, we have found at least one hypothesis which does make it possible to fulfil the conditions we have laid down for a neurography that is good for every member of a community as well as for the community as a whole.

§ 4. SUMMARY

To sum up: the neurography which every citizen of an independent commonwealth would wish to have, and which his teachers should help him to acquire, in his own interests and for the sake of the community, includes a dominant centre, an intermediate work-system, and a relatively unorganised fringe.

The dominant centre consists of the deepest neurograms. They correspond to a hypothesis concerning the central truths of the universe. These essences cannot as yet claim a place in the realm of facts. They have yet to be discovered by hypothesis and experiment, such as have led scientific thought to its present position on the road towards the 'neat,

¹ See above, p. 217. We observe that our problem could not be solved were we to assume the highest good to be the welfare of one particular nation (as many Nazis suppose), or of one particular class (as many Bolsheviks believe). For it is not conceivable that a part of mankind should be greater than the whole. Still less possible is it to imagine that such a part should be the greatest thing in the universe, the central essence of the endarchy of knowledge.

² See below, pp. 289, 295.

trim, tidy, exact world' that we have called the endarchy of knowledge. The deepest and most central elements of the neurography also correspond to a hierarchy or endarchy of purposes in harmony with those of other citizens of the commonwealth. Every citizen's self-regarding sentiment¹ is therefore represented by elements at the heart of his neurography.

The work-system of neurograms—and the wider it is, the better—corresponds closely to the discovered essences of those regions of the realm of facts with which the work of its possessor has most to do. In so far as these regions are not yet connected in the realm of facts, the work-system is linked together, or integrated, by the central elements of the neurography. While these central elements in the neurographs of all citizens correspond to much the same essences in the endarchy of knowledge, the work-systems of different individuals differ according to their different occupations.

The relatively unorganised fringe of each citizen's neurography is loosely tied together by the elements at the centre and by the work-system, but always so that the deepest neurograms are most central. This region of the neurography is peculiar to the individual² except in so far as nature or nurture gives common elements to members of the same family, or of the same school or college or university, or to dwellers in the same neighbourhood.

The building of a neurography towards this ideal cannot be left to chance. It is largely a matter of Will, the pupil's and his teachers', despite the tendencies we noted at the beginning of this chapter. In particular, a master-purpose to know God—with its inevitable subsidiaries, to serve God

¹ See above, pp. 77 and 157.

² But see below, p. 305.

and the commonwealth—will not dominate the personality except as the result of an effort of Will, an act of faith, the intentional adoption of a hypothesis with a view to testing it in action and altering it to fit experience.

When the pupil and his teachers have made their effort and attained their object, further efforts will be needed from time to time, or even from day to day, to prevent the effect from wearing off. The man who is engrossed by his work, and constantly deepening the elements of his work-system that correspond to discovered essences of a particular branch of knowledge, will find that the deepest of these elements, being constantly excited, tend to become the deepest of all in his neurography. So it was that, when Napoleon asked the astronomer Laplace how he came to write a book about the heavens without mentioning the name of God, Laplace replied: 'Sire, je n'avais pas besoin de cette hypothèse-là.' Had Laplace's studies been based on Einstein instead of Newton he might not have felt so complacent. Nevertheless, constant vigilance is needed lest one should act as though nothing in the world mattered so much as one's own work.¹

¹ Cf. Dr Jowett's remark to the present Archbishop of Canterbury, when Dr Jowett was Master of Balliol and Dr Lang, as an undergraduate of the College, held in his rooms the first meeting on behalf of university settlements and of Toynbee Hall in particular: 'You are making a very great mistake', said Jowett. 'You forget that you came here not to reform the East End of London but to get a First Class in *literae humaniores*' (see *The Times*, 3 November 1938).

On the other hand, there are some who go to the opposite extreme. They hold that a man's work, and the knowledge and skill he needs to do it well, are as nothing compared to unreasoning acceptance of unverified dogma. They do not share St Peter's readiness to give a reason for the hope that is in them. Rather does their point of view resemble that of the old-time Turkish official who wrote to an English seeker after statistical information: 'The thing you ask of me is both difficult and useless. Although I have passed all my days in this place, I have

No amount of specialised knowledge or skill will make up to a man for the lack of a master-purpose that integrates his whole life.¹ The simple soul who retains the childish theology described on p. 223 above may come nearer to understanding the most valuable facts, the most central truths, of the universe than many a man who fancies himself as wise and prudent, who holds with Mr Gradgrind that 'what we want is facts', but who fails to see that the hypotheses of to-day provide the facts of to-morrow.

Wide and diverse experience linked to expert knowledge and skill so as to form a single interest (rather than several separate interests), and all dominated by a supreme purpose in harmony with those of one's fellow-citizens, is therefore to be the aim of education so far as it is concerned with forming neurograms:² a conclusion foreseen in Chapter I.³

'A man should know something of everything and every-
neither counted the houses, nor inquired into the number of the inhabitants; and as to what one person loads on his mules and the other stows away in the bottom of his ship, that is no business of mine. But, above all, as to the previous history of this city, God only knows the amount of dirt and confusion that the infidels may have eaten before the coming of the sword of Islam. It were unprofitable for us to enquire into it. O my soul! O my lamb! Seek not after the things which concern thee not. Thou camest with us and we welcomed thee—go in peace.... Listen, O my son! There is no wisdom equal unto the belief in God! He created the world, and shall we liken ourselves unto Him in seeking to penetrate into the mysteries of His creation? Shall we say, Behold this star spinneth round that star, and this other star with a tail goeth and cometh in so many years! Let it go! He from whose hand it came will guide and direct it.' (Letter quoted by William James and McDougall, *Social Psychology*, p. 311, from Sir A. Layard's 'Nineveh and Babylon'.)

¹ Cf. a letter in *The Times* of 6 November 1934, in answer to one who had said that 'The proper end of man is knowledge of the universe'. See also p. 292 below.

² Cf. Morton Prince: 'Every form of education necessarily involves the artificial formation of such complexes....' (*The Unconscious*, p. 289.)

³ On p. 2 above.

thing of something.' So Lord Brougham held more than a century ago. It has been said¹ that Lord Brougham's idea of an educated person is no longer tenable now that the realm of facts is so much larger than it was in his day. But so long as we do not lose sight of the essential distinction, illustrated on p. 227 above, between the expert and amateur ways of knowing anything, we may still recognise the truth expressed in his words. All a man's knowledge and all his feelings should, however, be linked up to form a *single wide interest*. Its counterpart in neurograms is the single wide interest-system, the ideal neurography, that we have been studying in this chapter. By its means the whole flux of his experience is most conveniently arranged for handy reference.² It secures for him, as nearly as the conditions of human life permit, a perfectly integrated mind. And when every citizen of a commonwealth possesses this type of neurography, harmony is assured between the master-purposes of them all. Moreover, the excitement of any part of a single wide interest-system will tend to spread towards the centre of that system. Its possessor will thus be constantly reminded of his master-purpose.

Our conception of a 'single wide interest' will be enlarged when we discuss the foundations of character. Meanwhile, we define a 'single wide interest' as the organisation of thought that is represented by the ideal neurography we have just described. To organise each pupil's thought as a single wide interest is, so far as we have yet seen, the aim of education.

¹ By the Consultative Committee of the Board of Education in their Report on Secondary Schools (1938), p. 172.

² Cf. Whitehead, *loc. cit.* p. III.

CHAPTER 12

GROWTH OF SINGLE WIDE INTERESTS

§1. CURIOSITY

OUR first neurograms are as old as we are. A new-born baby's iris contracts when a light is held near its open eyes. In lower animals more complex reflexes, sometimes called instincts, exist from the very beginning. The chicken that pecks at grains of corn when hardly out of its egg has not been taught to do so. The link between its neurogram for the grain of corn and its other neurogram that is excited when it stoops and pecks is certainly innate and seems to be fully developed at birth.

Experience, in the form of sense-impressions, alters and adds to our innate neurograms. So great is the change that the casual observer may fail to recognise instinctive and other innate processes when he sees them at work in men and women.

The transformation of an innate neurography by subsequent experience is part of education in the widest sense of that word. What we commonly call education, education in which man intervenes, is concerned with forming neurograms corresponding, not to all the facts of experience, but only to those selected by human educators.¹ But long before the pupil is old enough to play an active and voluntary part in his own education, his neurography, representing his instincts and interests, already influences its own further

¹ See above, p. 20.

development. Facts that 'hunt in couples' in the world of experience certainly tend to be represented by connected neurograms.¹ But we have seen² how every man pays special attention to those particular partial aspects of his experience that are linked with his existing interests and instincts. This subjective factor impairs the likeness of any individual neurography to the objective realm of facts.

There is, however, one instinct that has an opposite effect. The instinct of curiosity, with its linked emotion of wonder, tends to make a man's neurography agree more closely with the realm of facts. It would seem that this instinct is aroused when an object resembling something familiar is noticed for the first time.³

My curiosity is stirred if I see for the first time a striped horse or a spotted cat. The zebra is, in McDougall's phrase, 'similar to, yet perceptibly different from, familiar objects [horses] habitually noticed'. Its strangeness is due, in Poincaré's words, to 'the unlooked-for occurrence together of objects'—*stripes* and *horses*—'not habitually associated'. The effect of the instinct is, by a 'circular nervous process',⁴ to increase the excitement both of my old neurogram for the horse and of my new one for the zebra. By our third law,⁵ the excitement concentrates in these two neurograms

¹ But see above, p. 227.

² Above, pp. 114 and 115, on how interest-systems tend to grow during involuntary thought.

³ Cf. W. McDougall: 'The native excitement of the instinct would seem to be any object similar to, yet perceptibly different from, familiar objects habitually noticed' (*Social Psychology*, p. 57); and Poincaré: 'Elegance', which, as Poincaré explains, causes emotion, doubtless the emotion of wonder, 'may result from the feeling of surprise caused by the unlooked-for occurrence together of objects not habitually associated' (*Science and Method*, p. 31).

⁴ See above, p. 106.

⁵ Of convergence: see above, p. 104.

(Nm and Lm in Fig. 8). After an intermediate stage, shown in Fig. 9, when excitement is concentrated at the m ends of these neurograms, there emerges a new thought, **M**, of an essence common to the zebra and the horse, 'a horse in general', with or without stripes, with long ears or short. At the same time there emerges, as a separate element (M in Fig. 10) of my neurography, what had previously been an undifferentiated part of my neurogram for the (unstriped) horse. It is now a part of my neurogram (LM) for the zebra as well of my neurogram (NM) for the horse. It links the two together, even as, in the realm of facts, the

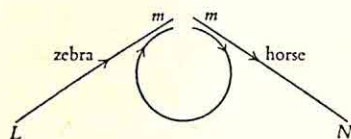


FIG. 8



FIG. 9

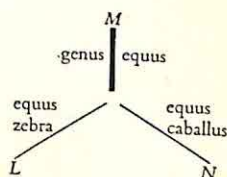


FIG. 10

essence *genus equus* unites the essences *equus zebra* and *equus caballus*.¹ Just so, indeed, was the realm of facts itself built up.

In the example of the zebra and the horse, we have seen how curiosity worked towards a fuller apprehension or clearer perception of the similarity and the difference between the two animals. This is the goal towards which the instinct strives, not in this case only, but in general.² Whenever a neurogram, N , especially of some interesting and familiar object, drains the excitement from another neurogram, L ,

¹ The ass of course belongs to the same genus; but we have ignored him for the purpose of our illustration.

² Cf. W. McDougall: 'The goal towards which this instinct strives is fuller apprehension, or clearer perception, perception definite enough to determine some other instinctive reaction.' (*Outline of Psychology*, p. 143.)

of a similar yet perceptibly different object, so that *L* becomes linked to *N* for the first time, a 'circular nervous process' is set going and increases the excitement of *L* and *N*. The newly formed link between *L* and *N* is thus deepened, and the interest-system¹ *LN* is made more permanent. At the same time, the excitement of *L* and *N* continues long enough for common elements (corresponding, like *M* in Fig. 10, to common essences in *L* and *N*) to be abstracted until at last the path of low resistance between *L* and *N* no longer represents the *empirical*² relationship of any two objects that are thought of together but corresponds more nearly to the *reasoned* relationship of *L* to *N* in the realm of facts.

Another example will help to make this function of curiosity still more clear. It is needed because the connexion between three adjacent essences of the realm of facts is either of the type *L-M-N* (Fig. 10) or of the type *P-Q-R* (Fig. 12). Suppose, then, the story about Newton and the apple to be true. After much reflexion, and ultimately with considerable excitement, Newton has formulated his second law of motion: that force varies with the mass-acceleration it produces. Force and acceleration are then familiar facts, and their neurograms are closely linked in Newton's brain. Indeed, they form part of a 'force' interest-system, although it is unnecessary, for the purpose of our illustration, to

¹ The horse, although it must be 'familiar' in order to stimulate curiosity when a zebra is first seen with it, need not perhaps be 'interest-of' in the sense in which the word interest is used on p. 82: thought of the horse need not perhaps stir our feelings in order that our curiosity may be aroused. But, when once curiosity has received its stimulus from the horse and the zebra together, affective neurograms are added to cognitive and *LN* becomes an interest-system, or part of one.

² See above, pp. 226, 227.

assume the presence of affective neurograms at this stage.

Then Newton goes into the orchard and notices an apple fall with uniform acceleration. So soon as the acceleration of the fall, resembling the familiar (to Newton) acceleration due to force, is noticed for the first time, there is the appropriate stimulus¹ to curiosity. He feels the emotion of wonder.² The conative element in his curiosity makes him seek for an explanation—a clearer perception or fuller apprehension³—of the connexion between force and falling. He wants the

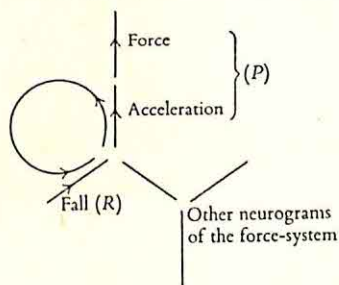


FIG. 11

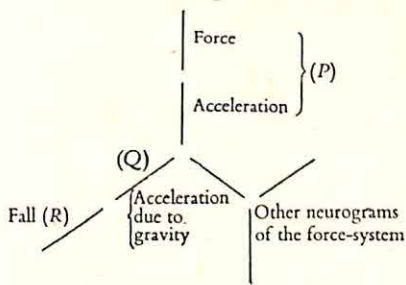


FIG. 12

meaning of the connexion. He wants a reasoned relationship in place of an empirical link. And he finds what he wants in the conception of 'acceleration due to gravity': an essence, Q, corresponding to Q in Fig. 12. This Q is abstracted from P and R which correspond to P and R of Fig. 11. His 'force' interest is for ever the wider because of his new law of gravitation.

¹ Or, as Poincaré has it (see footnote 3 on p. 238), the stimulus consists in the surprising occurrence together of the familiar conceptions of 'falling' and of 'force'.

² Among the visceral arcs included in the affective part of the neurogram of curiosity are probably arcs the excitement of which causes the erection of the hairs of one's body, the phenomenon known as 'goose flesh'.

³ See second footnote on p. 239.

So we see how the instinct of curiosity tends to build the realm of facts in the thought of its discoverers¹ and then to copy their thoughts, and therefore their neurographies, in those who come after. Curiosity also helps to deepen as well as to widen growing interest-systems because, as we have seen, it increases excitement in the interest-system whenever there is added to it another neurogram (or system of neurograms) of something similar. Curiosity apart, a fortuitous link between two neurograms would not be likely to last. If, for example, they represented wholly dissimilar objects—say, sunlight on a mutton-chop—the stimulus to curiosity would be lacking; and unless the sunlit mutton-chop were noticed at a moment of great emotional stress, no lasting link would remain. Or if the fall of Newton's apple had lacked acceleration, there would have been no link of similarity between it and his interest in force and the effect of force. His curiosity would not have been aroused. The apple's fall would have remained unnoticed or, at most, have distracted his attention hardly at all from his favourite topic. The link between its neurogram and

¹ The *Spens Report*, in its account (on p. 162) of the 'rhythm' in the history of 'subjects', recognises the leading part played by curiosity or wonder in the earliest phase. Electrical science is taken as an instance. 'In the eighteenth century... it began with a period of wonderment and delight in marvellous and bizarre phenomena for the first time brought to light—the wonders of the electrical machine, of the Leyden jar, of the voltaic pile': the period of curiosity, when the subject is but a part of the unorganised fringe of knowledge (see above, p. 233). Then came 'the exploitation of electricity in the service of man', when the subject belonged to the work-systems of its discoverers (see above, p. 233). Finally there is 'the contemporary phase—initiated by the great work of Clerk Maxwell—in which the physicist seeks to construct a picture of the whole material world in terms of electrical entities', when the science is being integrated with the central region of the endarchy of knowledge (see above, p. 232).

his 'force' interest-system would have been shallow as well as empirical.

Lest it be said that we have made too much of an imaginary incident, we recall¹ Darwin's account of his voyage in H.M.S. *Beagle*. The ship, having nothing familiar about it, aroused no curiosity in the minds of the Fuegians, but the ship's boats reminded them of their own canoes and seemed to them most wonderful, as did other 'simple circumstances—such as the beauty of scarlet cloth or of blue beads'.²

Our account of the part played by curiosity in building a single wide interest and in discovering the realm of facts may be compared with the process called by Spearman 'noe-genesis'. In his book on *The Nature of Intelligence* (1927) he describes the process as the 'eduction of relations' and the 'eduction of correlates'. These 'principles' he defines as follows: *The mentally presenting of any two or more characters (simple or complex) tends to evoke immediately a knowing of relation between them* (p. 63); and *The presenting of any character together with any relation tends to evoke immediately a knowing of the correlative character* (p. 91). In our exposition we have not found it necessary to distinguish between one kind of essence which Spearman would call a 'character' and another kind which he would describe as a 'relation'. His 'fundaments', 'attributes', 'character' and 'relations' are, from our point of view, all facts. While, however, we do not distinguish between 'the eduction of relations' and 'the eduction of correlates', we do see an essential difference between the connexions of the three neighbouring essences

¹ See above, p. 95.

² *A Naturalist's Voyage Round the World*, pp. 219, 229.

L, M, N, in Fig. 10 ('the inductive leap': see below, p. 255) and those of P, Q, R, in Fig. 12 ('the deductive syllogism').

Poincaré has described how he came to make his mathematical researches. His account fits in well with our conclusion that the instinct of *curiosity urges men to discover the realm of facts and ultimately the endarchy of knowledge; and to build up their own neurographies so as to resemble it.*

'The scientist', writes Poincaré, 'does not study nature because it is useful to do so. He studies it because he takes pleasure in it, and he takes pleasure in it because it is beautiful.'¹ Now when we do things under the compelling force of instinct, we may say, with McDougall,² that we act so because an *instinct* is driving us; or we may say, with most unsophisticated persons, that we act so because we feel the corresponding *emotion* (e.g. because we are angry or frightened or distressed); or we may say, with the hedonists, that we so act for the sake of the *pleasure* or satisfaction we shall feel when the instinct has achieved its end. If we are neither familiar with modern psychology nor altogether unsophisticated we shall probably account for our conduct in this third way. It is, in effect, the account Poincaré gives of his motives for organising his thought and making his scientific discoveries.³

Again, the 'nature' studied by Poincaré is 'a hierarchy of

¹ *Science and Method*, p. 22.

² See above, p. 77.

³ He gives several accounts; or, rather, he describes the same feelings and motives in several different ways. The account followed in our text strikes the keynote of all the rest; and is, moreover, the one which Poincaré himself puts first. From some of the others we shall quote in the following pages. The reader who desires still more evidence that Poincaré's observations confirm our generalisation (in italics at the end of the preceding paragraph of our text) is referred to Poincaré's book, *Science and Method*.

facts',¹ our realm of facts. 'Harmonious'² is the word he uses to describe its organisation. And it is so designed as to make for 'economy of thought, . . . economy of effort'³ in thinking in the same way as does an endarchy of neurograms that resembles as nearly as possible the endarchy of knowledge.⁴

Once more, the process of studying or discovering nature, as described by Poincaré, begins with the *selection*⁵ of *simple*⁶ facts just as the building of the realm of facts begins with the *abstraction of essences*.⁷ We saw that the building of the realm of facts is continued by abstracting or selecting the most *general* essences as being the most *valuable* for our purpose because they *unite* the greatest number of facts.⁸ Just so Poincaré finds that the most *general*⁹ facts or laws are the most *valuable* for selection, and that their value depends on how many previously known elements they *unite*.¹⁰

Finally, Poincaré writes of the beauty of nature as 'beauty which comes from the harmonious order of its parts'.¹¹ For Poincaré 'beauty' and 'elegance' are synonymous.¹²

¹ *Loc. cit.* p. 16.

² *Loc. cit.* pp. 22, 30, 50.

³ *Loc. cit.* p. 23.

⁴ See above, p. 202.

⁵ 'We cannot know all the facts. . . . We must make a selection.' (*Loc. cit.* p. 15.) 'Discovery is discernment, selection.' (*Loc. cit.* p. 51.)

⁶ 'Our selection should be made [of] the most interesting facts, . . . those which have a chance of recurring. . . . Which, then, are the facts that have a chance of recurring? In the first place, simple facts.' (*Loc. cit.* pp. 17, 18.)

⁷ See above, p. 203.

⁸ See above, p. 205.

⁹ 'It is necessary, therefore, to think for those who do not like thinking, and as they are many, each one of our thoughts must be useful in as many circumstances as possible. For this reason, the more general a law is, the greater is its value. This shows us how our selection should be made.' (*Loc. cit.* p. 17.)

¹⁰ 'If a new result is to have any value, it must unite elements long since known. . . . and suddenly introduce order. . . .' (*Loc. cit.* p. 30.)

¹¹ *Loc. cit.* p. 22.

¹² See *loc. cit.* p. 59 and pp. 30, 31.

But 'elegance', he says, 'may result from the feeling of surprise caused by the unlooked-for occurrence together of objects not habitually associated'.¹ Or elegance may result from 'contrast'.² In either case the feeling of elegance occurs where the emotion of wonder might have been expected. Some of the conditions for curiosity were certainly present and all of them may have been. Poincaré sums up both cases in the words: 'Briefly stated, the sentiment of mathematical elegance is nothing but the satisfaction due to some conformity between the solution we wish to discover and the necessities of our mind.'³ These 'necessities' must mean 'instinct'. Poincaré himself uses the word when he speaks of the 'instinctive and unacknowledged preoccupation'⁴ that drives the scientist to search for truth; and again when he refers to 'our natural instinct for mathematical elegance'.⁵ And there is no instinct that can be meant except curiosity.

When, therefore, Poincaré speaks of studying nature⁶ he means organising thought on the lines of the endarchy of knowledge. The pleasure he takes in the study is no other than the aesthetic satisfaction that follows when an instinct achieves its goal. And the instinct here at work is curiosity. Thus Poincaré's evidence supports our account of the part played by this instinct in building the endarchy of knowledge and in giving individual neurographies some resemblance to it.

¹ *Loc. cit.* p. 31.

² 'The contrast between the simplicity of the means and the complexity of the problem presented.' (*Loc. cit.* p. 31.)

³ *Loc. cit.* p. 31.

⁴ *Loc. cit.* pp. 22, 23. The whole passage repays study.

⁵ *Loc. cit.* p. 60.

⁶ See the passage quoted above, p. 244.

Poincaré adds that 'this aesthetic satisfaction is consequently connected with the economy of thought'.¹ We now see how. For the 'aesthetic satisfaction' follows the success of curiosity in organising thought on the lines of the endarchy of knowledge, the most economical organisation possible.² We shall for the future use Poincaré's phrase 'aesthetic satisfaction' for the feeling that results when curiosity achieves its end.

§ 2. WILL AND CURIOSITY

We thus see how curiosity urges men to discover the endarchy of knowledge and to bring their own neurographies into some measure of harmony with it. But the organisation of thought, or of your thought or my thought, is far from being wholly due to instinct. We have now to consider how the Will helps to organise thought.

Will, we said, comes into action when the automatic controls of thought are in conflict;³ its intervention makes new paths in the thinker's brain;⁴ and, of these new paths, those which yield the ideal solution of the conflict are, we said,⁵ made by reasoning. We observed that every step in reasoning has to be true,⁶ so that these new paths must correspond, element for essence, to the realm of facts or, where it is incomplete, to the endarchy of knowledge. Finally, we have just seen that curiosity tends to bring this resemblance about. But curiosity alone may not achieve it without the aid of Will.

Will plays a double rôle in helping curiosity to forge the true link, or find the true path, between the neurograms,

¹ *Loc. cit.* p. 31.

³ See above, pp. 133, 169.

⁵ See above, p. 194.

² See footnote 2 to p. 213 above.

⁴ See above, p. 171.

⁶ See above, p. 195.

A and Z, of two objects, A and Z. It first appears on the scene in an effort to work out what A and Z have in common and to make their similar essences familiar.¹ It comes on again after curiosity has been called into play by this similarity being first noticed.² Its part then is to check the instinct's performance.³ It has to test the new link reached by curiosity and make sure that it is true.

¹ 'Apparently there cannot exist in the entire cosmos any two constituents which are not definitely interrelated.' (Spearman, *The Nature of Intelligence*, p. 143.) Cf. also Wordsworth:

'Flower in the crannied wall. . .
Little flower—but if I could understand
What you are, root and all, and all in all,
I should know what God and man is.'

In the endarchy of knowledge, if not yet in the realm of facts, every two facts have at least one common essence, the central essence of the whole endarchy. The similarity between the two facts consists in their common essences. See above, Figs. 8 to 12 on pp. 239 and 241.

² See above, p. 238.

³ Poincaré quotes examples from his personal experience—and similar examples might be multiplied from the experience of other mathematicians and physicists—showing how the missing link in a chain of reasoning, which intense and prolonged efforts had failed to complete, would unexpectedly present itself during a holiday excursion or when 'crossing the street', and would stand the test of subsequent concentrated thought. Such inspirations are, Poincaré supposes (p. 60), due to the involuntary, or even unconscious, operation of that which we have identified with the curiosity-wonder process. And he adds: 'There is another remark to be made regarding the conditions of this unconscious work, which is, that it is not possible, or in any case not fruitful, unless it is first preceded and then followed by a period of conscious work. These sudden inspirations are never produced (and this is sufficiently proved already by the examples I have quoted) except after some days of voluntary efforts which appeared absolutely fruitless, in which one thought one had accomplished nothing, and seemed to be on a totally wrong track. These efforts, however, were not as barren as one thought; they set the unconscious machine in motion, and without them it would not have worked at all, and would not have produced anything.' (*Loc. cit.* p. 56.)

§ 3. THE FIRST PERIOD OF CONSCIOUS WORK

During the first bout of voluntary thinking (or, as Poincaré calls it, 'conscious work') the thinker makes repeated efforts, as in our example of the glass jar with the stuck lid,¹ to complete the path from *A* to *Z*. He comes back again and again both to *A* and to *Z* as he concentrates excitement in neurograms connected with either. Eventually there is found to be some similarity between thoughts arising from the excitement of two of these neurograms, one connected with *A* and the other with *Z*. When these similar thoughts first occur, there is the appropriate stimulus to curiosity, provided that one of the similar thoughts has by that time become familiar.² Then there may emerge a third neurogram that links the other two together, in the manner illustrated in Fig. 10 or Fig. 12,³ and so completes the path from *A* to *Z*.

The repeated excitement of *A* and *Z* during this first period of conscious work makes *A* and *Z* and the thoughts connected with them more and more familiar. So it strengthens the stimulus to the instinctive process, or 'unconscious work', that is to follow. Poincaré observed that, with this increased stimulus, the instinct often plays a most important part in mathematical discovery when, without it, the 'unconscious machine... would not have produced anything;' and we have already noticed⁴ how great an effect the activity of *Z* (and the same is true of *A*) may have in helping the reasoning process to make a true path from *A* to *Z*. 'As a rule', wrote William James, *Z* (and, similarly, *A*) 'overshadows the process from the start'.⁵

¹ See above, pp. 170 *et seq.*

³ See above, pp. 239, 241.

⁵ *Loc. cit.* Vol. II, p. 338.

² See above, p. 238.

⁴ On p. 171 above.

§ 4. THE PERIOD OF UNCONSCIOUS WORK

After the first period of conscious work comes the instinct's turn. Its work may be unconscious, as in Poincaré's experience of mathematical discovery. And this unconscious process may burst in upon conscious thought about something else. Then we feel inspired: we have a vivid conviction that *here* is the missing link between A and Z that we sought unsuccessfully during our first period of conscious work. Poincaré regards as 'most mysterious'¹ the fact that the solution—generally the true solution²—of our problem thus forces itself upon our attention when all the rest of the process, perhaps including tentative solutions, remained unconscious. But we need not look for an explanation beyond the increase of excitement that must result when the instinct is reaching its goal and when the excitement of A and Z and the neurograms between them is suddenly drained through the final link in the chain.

The feeling of inspiration is as if the thought which led to it had been, in Mr Kenneth Richmond's phrase, 'super-conscious'.³ At all events, creative thinking that discovers new truth has its best chance when active consciousness is somehow side-tracked: when the Will has done its work and when involuntary thought is running in a different channel. This removal of normal inhibitions⁴ may happen of its own accord, as when the new light breaks upon us

¹ *Loc. cit.* p. 58.

² See below, p. 251.

³ *Education and Liberty* (1918), p. 221. Again, on p. 237, he writes: 'It is instructive that, in the time of the Gothic, . . . buildings were produced which were not only miracles of art but miracles of engineering. It is impossible not to conclude that the extraordinarily complex strains and stresses of Gothic architecture were superconsciously worked out.'

⁴ Cf. K. Richmond, *loc. cit.* p. 239.

while 'crossing the street'. Or it may be intentional, as when we fix our attention upon a windmill on the horizon or a pattern on the carpet,¹ and so leave the involuntary, although conscious, train of creative thought free from interference.²

Let no one suppose that, in attributing our moments of inspiration to the free working of an instinct, we are debasing what is noble or confusing the 'superconscious' with the subconscious. Our highest thoughts may be influenced by emotions that we share with the lower animals. Love itself is an emotion, and $\delta\ \Theta\epsilon\acute{o}\varsigma\ \acute{\alpha}\gamma\acute{\alpha}\pi\eta\ \acute{\epsilon}\sigma\tau\acute{\iota}\nu$.³ There is no reason why divine inspiration should not operate through 'curiosity-wonder'.⁴

§ 5. THE SECOND PERIOD OF CONSCIOUS WORK

When curiosity has played its part, the Will comes on again. It is needed 'to work out the results of the inspiration, to deduce the immediate consequences and put them in order and to set out the demonstrations; but, above all, it is necessary to verify them'.⁵ For although 'when a sudden illumination invades the mathematician's mind, it most frequently happens that it does not mislead him, . . . it also happens sometimes . . . that it will not stand the test of verification'.⁶

¹ Cf. McDougall: 'The bodily attitude appropriate to intense thought' is 'one of complete immobility (as so well expressed in Rodin's sculpture "Le Penseur")' (*Outline of Psychology*, p. 291).

² Lord Rutherford once remarked to the present writer that it is as a young graduate with no responsibilities and no anxieties that one has one's best chance of making discoveries.

³ 1 John iv, 8.

⁴ Cf. K. Richmond: 'If any impatient Christian wants to know why I am leaving divine inspiration out of account, I will explain that I am doing nothing of the kind. I am trying to find out how it works.' (*Loc. cit.* p. 251.)

⁵ Poincaré, *loc. cit.* p. 56.

⁶ Poincaré, *loc. cit.* p. 60.

Suppose that, after trying without success to find a chain of reasoning between **A** and **Z**, I have an inspiration that **M** is the missing link. I must then regard **M** as a hypothesis to be verified by making sure, not only that every single step in my argument connecting **A** and **Z** is true, but also that every pair of successive steps fit together so as to leave no gaps.¹

In order to verify that every step in my argument is true by itself I must see that every two successive neurograms, say p' and q' , in my reasoned path from *A* to *Z* correspond to essences, *p* and *q*, which are directly or indirectly derived from² one another in the realm of facts.³ In other words, I have to make sure that, if *P* (or *Q*) denotes the whole string of essences from *p* (or *q*) up to the centre of the endarchy, then these simple abstract facts⁴ are such that one of them contains or includes the other. And this relation—that *P* is (contained by or containing) *Q*—between parts of the realm of facts is of course true if, and only if, *p* or *q* is directly or indirectly derived from the other.

I have next to ascertain that the true relation between p' and q' fits on to the true relation between q' and r' , so as to leave no gap in my argument.⁵ I have verified, we suppose, that

¹ The remaining paragraphs of this section are printed in solid type because they make difficult reading and may be passed over without interrupting the main argument.

² See above, p. 206.

³ This precaution is needed because p' and q' may correspond to other essences in addition to *p* and *q*. See above, p. 224. If I knew no carnivores but lions, I might mistake a Chow dog gnawing a bone for a new type of lion.

⁴ See above, p. 199.

⁵ This is also necessary because q' may correspond not only to *q* but also to other essences, say $q_1, q_2, \dots$, which are not derived from *p*. If then *r* were derived from q_1 instead of from *q*, it would *not* follow that *r* was derived from *p*. There would be a gap in the reasoned path where $r'q'$ failed to link up with $q'p'$.

P is (contained by *or* containing)¹ Q (1)

and that Q is (contained by *or* containing)¹ R (2)

But, before I can complete the deductive syllogism and assert that

therefore P is (contained by *or* containing)¹ R (3)

I have to make sure that the Q in relation (1), say Q₁, is the same as, or else derived from, the Q in relation (2), say Q₂, or *vice versa*; or, in other words, that

Q₁ is (contained by *or* containing)¹ Q₂ (4)

When I have verified (4) for every successive pair of relations (1) and (2), I can be sure that there are no gaps in my deductive reasoning; and that it leads straight down (or up, according as the first or second alternative is chosen in all the brackets) a direct line of essences in the realm of facts.

For example, the line may go up from A to m and then down from m to Z. In that case m is the highest or most central or most valuable essence in the shortest route from A to Z in the endarchy of knowledge. If, as is usual, the thought of m is the inspired product of curiosity, my inspiration is linked to A and to Z by deductive reasoning alone.

But it is only when an essence, a, of A and an essence, z, of Z are directly derived, the one from the other, that the path between them is wholly ascending or wholly descending in the endarchy of knowledge. The path between any two essences, say l and n, selected at random, consists of an ascending path from l to m and a descending path from m to n. Then l can be linked to m, and m to n, by deductive reasoning. But the three essences, l, m and n, cannot be linked by

¹ The words 'contained by *or* containing' are placed in brackets so as to conform to the general usage which links the elements of a syllogism by the word 'is'. If the first of the two alternatives is chosen in relation (1), it must also be chosen in (2), (3) and (4); and *vice versa*.

the deductive syllogism in (1), (2) and (3) above. We can only say that the simple fact M^1 —the whole string of essences from m to the centre of the endarchy—forms part of, or is contained by, L ;¹ and that it also forms part of N .¹ This relation may be put in the form

N is (containing) M;	}	 (5)
every (example ² of)		
L is similar to N;		
and therefore every (example ² of)		
L is (containing) M.		

Apart from the words in brackets, this is the ordinary inductive syllogism: a general inference from particular instances. We recognise it at once if we take the example illustrated above in Fig. 10.³ Then the relations in (5) become

the horse species (<i>equus caballus</i>) is of the	}	 (6)
<i>genus equus</i> ;		
every zebra is similar to the horse species;		
and therefore every zebra is of the <i>genus equus</i> .		

The word 'similar' in (5) or in (6) is a reminder that the stimulus to curiosity is present when these relations are first noticed.⁴ It is partly for this reason that the relation between l , m and n has been put in the form (5), resembling an inductive syllogism.

Another reason for using the form (5) is that any three successive essences in the direct path from a to z are connected *either* by any two of (1), (2) and (3) above *or* by any two

¹ We are using L , M , and N in the same way as P and Q on the preceding page; so that L , M and N denote the whole string of essences from l or m or n respectively to the centre of the endarchy.

² I.e. derivative of l .

³ See above, p. 239.

⁴ See above, p. 238.

lines of (5). Since the former set of relations belong to deductive reasoning, it is natural to identify the latter with induction.¹

Verification of the inductive link in a chain of reasoning also requires conscious work. The process is the same as before. After verifying that

L is (containing) M (7)

so that every example of L, or derivative of L, contains M, and that

M is (contained by) N (8)

I have still to make sure that the M's in these two relations are the same;² or, at least, that M₁ in (7) is the same as, or derived from, M₂ in (8) or *vice versa*; or that

M₁ is (contained by or containing) M₂. (4)

But this is relation (4) over again. When I have verified it for this case also, I can be sure that there is no gap in my train of reasoning as I make the inductive leap from an ascending to a descending line of essences in the realm of facts. The last possible gap in my chain of reasoning has then been closed during my second period of conscious work.

§ 6. AN ILLUSTRATION

It is easier to illustrate the process of discovery than to describe it in abstract terms as we have tried to do in the last three sections. We shall take a simple example of the three

¹ Cf. K. Richmond: 'The deductive process is the lower process, because there is nothing creative about it. . . I am here impelled to rush in where the framers of definitions have feared to tread, and to assert that pure inductive thought is, simply, intuitive thought, or superconscious thought. It is not "the method of reasoning from particulars to generals" as my dictionary puts it; that is the deductive process following, to check or confirm, the first inductive leap.' (*Education and Liberty*, pp. 221, 222.)

² That is, as before, because my neurogram, m', may correspond not only to m but also to other essences, say m₁, m₂, . . .

stages: the two periods of conscious work separated by 'an inspiration'.

Professor R. W. Wood of Baltimore noticed the fact, till then unknown to science, that when heat was applied to a pellet of sodium inside a glass bulb with no air in it, a brilliantly coloured film formed on the inside of the glass: and that the colours changed when the film was heated or cooled. How were these colours to be explained? What chain of reasoning would connect the cause with the effect in the realm of facts?

The connexion was made by first abstracting from the whole fact, *A*, of the heated sodium the particular essence, *a*, of its known reactions to heat. The next step was to abstract from the whole fact, *Z*, of the many-coloured film the particular essence, *z*, of its measurable¹ reactions to light. After that, but still in the first period of conscious work, attention was concentrated upon *a* and *z*. Then came an inspiration, *m*, the inductive link between *a* and *z*: it seemed that the coloured film might be made up of a vast number of ultra-microscopic spheres of sodium, piled on top of one another as the sodium vapour, produced by heating the pellet, condensed in tiny drops on the cold surface of the glass. Such a film might give rise to the observed colours and changes of colour. The process ended with a second, and somewhat prolonged, period of conscious work. The inspiration, *m*, was taken as a hypothesis, and a chain of deductive reasoning, conforming to the realm of facts, then

¹ The quantities measured are the proportions of light of various wave-lengths absorbed in passing through a certain thickness of film. The proportions vary with the wave-length and so fix the colour of the transmitted light.

linked 'm' to 'a' easily enough, and also, but not so easily, to 'z'.¹

Mr Kenneth Richmond found that children in school can better understand deductive reasoning when it is thus used to follow up and verify an induction, inspiration or guess, than when it is taught as the only process.² This may be due to the part played by curiosity in the former method. In any case, Mr Richmond's observation deserves notice because of the value in education of whatever makes for hard thinking.³

¹ To make the connexion between **a** and **m**, it was only necessary to verify that sodium vapour, in a vacuum, would condense in round drops, layer upon layer. But to make the connexion between **m** and **z**, it was necessary to calculate the coefficient of absorption of a medium made up of numbers of small metal spheres and to show (1) that this coefficient varied with the wave-length of the light, (2) that it was not the same as that of the solid metal (otherwise the film would have been throughout of the same colour as a thin film of metallic sodium, which was not the case), and (3) that it varied with the amount of metal per unit volume, thus altering as the film was heated or cooled. All these deductions from the hypothesis **m**, and their comparison with the actual films observed, may be described as 'action on the hypothesis **m**, with a view to its verification.' The calculations, and the whole reasoning, are given in two papers on 'Metallic Films' by the present writer (Garnett, *Phil. Trans.* Vol. ccciii (1904), pp. 385-420 and Vol. ccv (1905), pp. 237-88).

² *Loc. cit.* p. 226.

³ See above, pp. 151 to 153.

CHAPTER 13

THE FIFTH LAW

§ 1. THE END OF A TRAIN OF THOUGHT

OUR inquiry has led us from the study of reflex actions to the flow of conscious thought, first when the Will does not intervene, and afterwards when it does. We have now to ask what stops the flow. How does a train of thought come to its end?

Everyday life shows us three distinct ways of ending our thought on any one topic. Some sense-impression from outside or inside the body may be strong enough to drain the excitement—as in our third law—from all the active neurograms that correspond to this topic. Or the excitement may simply die down without stimulating any other neurogram. Or, in the third place, the excitement may end in giving rise to bodily movement. Let us look again at each of these three processes.

The interruption of a train of thought by an irrelevant sense-impression or emotion is familiar to everybody. A flash of lightning, a cry for help, a sting from a wasp, an inspiration such as we considered in the last chapter, or a gnawing anxiety is likely enough to distract my attention from the subject of my thought. But, by our third law, the greater the excitement that goes with a train of thought, the more intense must be the sense-impression or emotion that is to interrupt it. We have seen how one's 'absorption may be so deep as not only to banish ordinary sensations but even the severest pain'.¹

¹ See above, p. 105.

Sometimes a train of thought on an uninteresting topic seems to become less and less vivid until, for no apparent reason, it ceases altogether. Even when repeated efforts of Will have brought back a wandering attention over and over again, there may still be not enough excitement in the active neurograms to pass the neighbouring synapses. The stream of thought then dries up, as rivulets dry up in sandy channels when the flow is too slight. Our conscious thought may then cease for a while until it is set going again by some new stimulus; or we may simply go to sleep. Tiredness of the thinker, or lack of interest in the topic of his thought, and, above all, lack of purpose, combined with insufficient ability to make up for fatigue or lack of interest by the voluntary concentration of excitement, are the chief reasons for a train of thought fading out in this way.

But the natural end of every train of thought is neither interruption nor fading out. If all our thinking ended in one or other of these ways it would serve no useful purpose, whether biological, sociological or any other. There remains the third way of ending a train of thought: by bodily movement. Every thought-activity *tends* to lead immediately to action. This is William James' view. It is only the gradual making of new paths, of less resistance than natural paths of motor discharge, that causes our thought ever to lead anywhere else.¹ Such new paths, leading to further thought more readily than to immediate action, were our principal concern when we were lately discussing how to build up a single wide interest-system.²

'The reader will not have forgotten', wrote William

¹ See W. James, *Principles of Psychology*, Vol. II, pp. 581, 559.

² See above, Chapter 12 and p. 236.

James in his *Principles of Psychology*, 'in the jungle of purely inward processes and products through which the last chapters have borne him, that the final result of them all must be some form of bodily activity due to the escape of the central excitement through outgoing nerves. The whole neural organism, it will be remembered,¹ is, physiologically considered, but a machine for converting stimuli into reactions; and the intellectual part of our life is knit up with but the middle or "central" portion of the machine's operations.'² 'Movement', he added, '*is the natural immediate effect of feeling*'—that is, of thoughts of whatever kind³—'*irrespective of what the quality of feeling may be. It is so in reflex action, it is so in emotional expression, it is so in the voluntary life.*'⁴

McDougall takes the same view: 'Every cycle of mental activity naturally expresses itself in...bodily behaviour.'⁵ Nor is there any advocate of a different opinion. So we conclude that *action is the natural end of every train of thought*. This statement we take for our fifth law.

§ 2. THE FIFTH LAW FITS EXPERIENCE

At first sight this law hardly seems to fit the case of a man who has been puzzling over some problem for a long time when suddenly the desired solution flashes into his mind.⁶

¹ Cf. above, p. 42.

² *Loc. cit.* Vol. II, p. 372.

³ James used the word 'feeling' as equivalent to our 'thought'. This use he explains in Vol. I, p. 186 (*loc. cit.*).

⁴ *Loc. cit.* Vol. II, p. 527. The italics are those of William James.

⁵ *Outline of Psychology*, p. 289. Cf. also *Physiological Psychology*, p. 161.

⁶ In the case here supposed there is no interval between 'the first period of conscious thought' and the 'inspiration' (cf. above, chapter 12). Or else it is such a case as Poincaré describes in the words: 'Often when a man is working at a difficult question, he accomplishes nothing the first time he sets to work. Then he takes more or less of a rest, and sits down again at his table. During the first half-hour he still finds nothing, and then all at once the decisive idea presents itself to his mind.'... 'It is... probable that the rest was occupied with unconscious work.' (*Loc. cit.* p. 55.)

He has thought it out. His feeling of effort and the 'painful feeling' by which 'the continued obstruction of instinctive striving is always accompanied'¹ give way to a feeling of aesthetic satisfaction² so soon as an inspiration has provided the missing link in the chain of his reasoning. This change of feeling is, as we saw,³ probably due to movements of the viscera.

There would be no exception to our fifth law if the word 'action' were extended to cover bodily movements of all kinds. 'From the physiological point of view a gesture, an expression of the brow, or an expulsion of the breath are movements as much as an act of locomotion is. A king's breath slays as well as an assassin's blow.'⁴ From the standpoint of our fifth law, talking is, indeed, so perfect a substitute for other forms of action that it is all too apt to take their place, even in an emergency: a fire, or a shipwreck, or a national crisis. It may also happen that the bodily movements ending our trains of thought are both skeletal and visceral. The happy recipient of a bright idea may then indulge in weird behaviour at the same time as he rejoices. 'Mafficking' did not begin or end with Archimedes.

We have to see that our fifth law fits other available experience.

In the first place, it is consistent with the theory of natural selection. For, in the earlier stages of the struggle for existence, the fittest to survive would be those whose primitive thought led promptly to the action best suited to preserve the individual and the species. In those early times thinking

¹ McDougall, *Social Psychology*, p. 28.

² See above, p. 247.

³ See above, p. 71.

⁴ W. James, *loc. cit.* Vol. II, pp. 527, 528.

was always for the sake of doing. This was the kind of thinking that would be developed by natural selection.¹

Again, the fifth law fits the everyday experience of us all. We can all verify that we tend to make any movement,² and to utter any word, that we think of hard enough. Some people go so far as to 'think aloud'.

We also tend to re-enact or reproduce every scene or visual object that we imagine vividly enough, although this last tendency may become less marked than the others as we come to realise our limitations in this field. So we can see for ourselves how all our images, whether motor or auditory or even visual, tend to lead to action.

In the case of motor and auditory images this tendency is obvious and unquestioned. But the corresponding tendency of visual images is not so well understood. Examples of it are provided by those visualisers who never like to think or talk without pencil and paper to illustrate their ideas.³ It is, however, among children that this tendency is most apparent. The normal child delights in 'realising' the objects of his visual imagery. He may be content to express them in the flat by means of finger and sand-tray, pencil and paper, or

¹ Cf. W. McDougall: 'Regarded from the biological point of view, the function of all mental process and mental structure is to preserve and promote the life of the race and that of the individual in so far as he subserves the life of the race. The life of the race is preserved and promoted by bodily activities. . . . All mental activity, then, normally issues in bodily movement; since only by promoting and guiding bodily movement can it fulfil its function.' (*Psychology*, p. 105.)

² See McDougall, *Physiological Psychology*, p. 161, and W. James, *loc. cit.* Vol. II, p. 525, for examples of this tendency.

³ Engineers and architects often show this tendency. There is also the mathematician who, as he calculates and *visualises* the motion of a spinning top or an advancing wave, is inclined to illustrate the motion with a gesture.

paints and brushes; but he will probably prefer to realise them in the solid with the help of wet sand, clay, plasticine, wooden or stone 'bricks', 'meccano', or even a wood or metal work-shop.

Whenever a thought finds expression in bodily movement, the tendency stated in our fifth law is fulfilled. The corresponding neurogram is then deepened by the 'circular nervous process' already described.¹ Hence the value of writing down, even on a slate that will soon be wiped, a word that one wishes to remember, or of repeating an experiment that one does not wish to forget.

It is, however, possible that a thought, say **A**, may not be vivid enough to produce movement; or that the excitement of the corresponding neurogram, *A*, may not be strong enough to pass the synapses on the way to the Rolandic cortex and so to stimulate the motor nerves. In that case an effort of Will may increase the excitement and make the thought lead to action. The neurogram, *A*, is then deepened by the effort of Will as well as by the 'circular nervous process' of the last paragraph.

§ 3. PEDAGOGIC COROLLARIES

The value of the maxim 'learn by doing' lies, as we have seen,² in the deepening of a neurogram that results from its excitement spreading to the motor nerves. The corresponding thought is better remembered when it promptly leads to action. It recurs more often, is more vivid when it does come back, and is more likely to link up with other thoughts, including emotional feelings, so as to become interesting.

That is why, in some schools, practical work may be of great value in forming a centre of interest to which all the

¹ See above, pp. 69 to 71.

² See above, p. 78.

other studies may be linked. Especially in schools where the general ability (g) of the children is low, where their purpose-factor (w) has not been developed, and where their power to concentrate attention is consequently feeble, the creation of an interest in practical work will help them to learn their lessons. For the excitement of the interest-system will then spread¹ to the neurograms of otherwise uninteresting facts that the children have to study. These neurograms will thus be deepened and the facts remembered. Because they are linked up with other facts in the same interest, they will also be better understood.

In some cases the deep interest-system created by handwork may be made deeper still by choosing the right kind of handwork. It should bear directly upon some of the existing interests of the pupils, especially if these interests are rich in emotional elements. This principle is applied in many Junior Technical Schools and Works Schools, in some Central Schools, and in most 'part-time' day or evening classes for pupils whose ordinary employment occupies the greater part of their time. In most of these cases, the pupils' practical work has to do with their present or future occupation. But even where this cannot be managed, most young people between twelve and sixteen years of age readily take an interest in handwork,² especially in handwork combined with outdoor activities such as are practised by Boy Scouts and Girl Guides. With such a central interest other school studies can be linked up.³

¹ See above, p. 108.

² Cf. Dr G. Kerschensteiner, who organised the schools of Munich in the early years of this century: 'Children do in fact like manual work of the right kind' (*Schools and the Nation*, p. 121).

³ See below, p. 301, particularly the first footnote.

It is not of course only because of its effect upon other studies that practical work of various kinds fills so large a place in modern education. Among its direct advantages, four stand out. Some facts can best be learned, or perhaps can only be learnt, in a workshop or laboratory or, at all events, by practical work of one sort or another: they include the strength and 'feel' of materials, and the structure of plants or animals. Again, work on things as they appeal to our senses serves as a useful check upon the thought of a student who is mainly concerned with the abstractions or essences of his science. Further, it is only by doing things that one can learn to do them; and trades or crafts may be learnt in some school workshops, even as the technique of a physicist or a chemist may be acquired in some university or college laboratories. Lastly, if we all learned to work with our hands at school, our greater appreciation of, and respect for, manual skill would increase the sense of comradeship in our community.¹

On the other hand, over-much practical work can lessen the value of some people's education; and for three reasons. If it be true that power to concentrate attention improves with practice,² the very same process that strengthens memory and awakens interest in children of low ability would deprive abler children of their best opportunities to overcome difficulties by efforts of Will combined with purpose. If able children can indeed increase their ability (*g*) by hard thinking, and if we were right in saying that the purpose-

¹ Cf. *Spens Report*: 'It is, in fact, the gravest defect of the present system that a boy or girl may pass through a secondary school having made no contact, or next to none, with one tradition—that of the arts and crafts—which is certainly not the least noble or the least ennobling' (p. 158).

² Cf. above, pp. 150-153.

factor (*w*) can, in any case, be increased by doing work that is just not too difficult, the path of learning must not be made too easy, whether by over-much practical work or in any other way. Another reason for avoiding over-much practical work is that it wastes time and energy. Whoever can understand and remember what he reads without reading aloud wastes time and energy by pronouncing every word as he reads it. So also time and energy that might be given to the strenuous intellectual discipline of mathematics or Latin prose can easily be frittered away in mild experiments or even in 'bottle-washing'.¹ There is, perhaps, a third ground for not allowing children too much freedom of bodily movement; for to give free rein to the tendency expressed by our fifth law would spoil one's thinking by letting every train of thought end too soon in action.

¹ Cf. the *Spens Report*: 'Much of the time, we believe, now spent in "experimental work" [in secondary schools] could be better employed' (p. 250).

CHAPTER 14

CONDUCT

§ 1. THE EFFECT OF A SINGLE WIDE INTEREST

YET in the end, whether it come soon or late, my thinking is always for the sake of my doing. We have seen how good it is for every member of a community, every citizen of a commonwealth, to possess a single wide interest;¹ how it makes for efficient reasoning, freedom of action, wholeness of mind (i.e. immunity from 'conflict'), enhanced power of Will, and consistent behaviour;² how it ensures harmony between the purposes of the several citizens and enables all of them to work together for the good of each.³ We have now to see how a single wide interest affects the ending of a train of thought. Will it tend to prevent trains of thought from being interrupted or from fading out and make them lead instead to action? If so, what effect will it have upon that action?

A wide interest-system tends to reinforce the excitement in every neurogram connected with it.⁴ The excitement of a rival neurogram by a sense-impression or other interruption will therefore have to be more intense if it is to drain excitement from any part of a very wide interest-system. That follows from our third law. The possession of a single wide

¹ Above, p. 236.

² Above, p. 222.

³ Above, p. 231.

⁴ On p. 108 above we saw that 'when once any considerable interest-system—especially if it be rich in emotion elements—has been stimulated, it will tend for some time to reinforce the excitement of any neurograms connected with it'.

interest thus tends to prevent one's thought from being distracted or interrupted.

For the same reason it makes one's thought less likely to fade out. Fading out happens when the thinker is sleepy or tired; when the fringe of his thought is unusually narrow, perhaps because no wide or deep interest-system is active; and when, from these and other indications, it seems to him that his excitement is least. Whatever increases his excitement will tend to prevent his thought from fading out. And his excitement will be increased by any connexion his train of thought may have with a wide and deep interest. His possession of a single wide interest ensures that such connexions exist. It therefore tends to prevent his thought from fading out.

On the other hand, a single wide interest increases the natural tendency of every train of thought to end in action. For the excitement tends to spread from any part of a single wide interest-system towards the purpose-neurograms at its centre.¹ They in turn tend to influence every action that is neither reflex nor habitual.² More than that, they tend to initiate action; for no one can think of his purposes for the future without thinking also of what he might do now to fulfil them.

Suppose that I possess a single wide interest. At its centre is an endarchy of purposes,³ mutually consistent and dominated by a master-purpose. Whenever I contemplate any kind of action, I tend to think of its consequences. These lie in the future along with the fulfilment of my master-purpose. The excitement of the purpose-neurogram, *P*, will have upon

¹ See above, pp. 177, 178.

² See above, p. 167.

³ Built up as described on p. 230 above.

the excitement of the neurogram, *Q*, of my intended act and its consequences, the directive influence illustrated on pp. 112-114. Moreover, when *Q* is first thought of along with *P*, any similarity or contrast between them stimulates curiosity-wonder. The instinct tends to link them together,¹ in such a way that *P* is widened by the accession of *Q* and at the same time deepened by the instinctive process. And, unless I use my Will to counteract it, this involuntary process tends to make all my acts fit harmoniously into my purposes and helps to realise them. If I make a practice of using my Will² to increase the excitement of *P* before I take action, my chance of acting consistently with my master-purpose will be all the greater on this account.

But now imagine that, as is only too likely, my single wide interest is imperfect. A rival principle is also at work within me. It may be inherited from a long line of pre-human or savage ancestors. It comes into conflict with my master-purpose, *P*, whenever I am tempted to commit an act that may give me short-lived pleasure but that is incompatible with my deepest convictions. I have then to choose between two alternative courses. The conflict—between the ‘spirit’ and the ‘flesh’, perfectly described by St Paul in his letter to the Romans³—gives me an opportunity to strengthen

¹ In the manner described in Chapter 12, § 1.

² It is probable that this generally happens, but is by no means necessarily all that happens, when, before taking any important action, the devout man prays to God, to serve whom is his highest purpose. On one occasion, for example, Nehemiah wanted to ask a great favour from King Artaxerxes. ‘Then the king said unto me, For what dost thou make request? So I prayed to the God of heaven. And I said unto the king...’ (Nehemiah ii, 4, 5.)

³ Ch. vii, verses 15 to 23. See also Mark xiv, 38: ‘The spirit indeed is willing, but the flesh is weak.’

my purpose by the use of my Will; and curiosity-wonder will help me to choose whichever course fits harmoniously into, or is consistent with, this purpose. But if I give way to the low propensity, I shall have missed my chance to strengthen my high purpose, and shall therefore be more likely to yield to a similar temptation in future. In case of doubt I shall know whether my high purpose, which St Paul¹ would identify with myself,² or my lower nature has prevailed by the feelings said to be due to an approving or a disapproving conscience.

What are these feelings? Perhaps we need look no further for the one than the feeling of aesthetic satisfaction due to the harmony between my master-purpose and the action I decide to take; and no further for the other than the conflict that I leave unresolved. That my master-purpose should have this close relation to my conscience will not surprise us if we remember³ how the self-regarding sentiment is linked up with the central purpose in a single wide interest, and how intimate the relation of one's self to one's conscience is commonly supposed to be.

Yet another advantage vouchsafed by a single wide interest to its possessor lies in the help it gives to prolonged continuous thinking. Lengthy trains of reasoned thought are often needed to prepare for action that will attain one's ends. But my thought will be likely to end in hasty and ineffective action, because the paths of lowest resistance from my excited

¹ 'For the good that I would I do not: but the evil which I would not, that I do. Now if I do that I would not, it is no more I that do it.' (Romans vii, 19, 20.)

² Cf. above, p. 157, where we saw that the neurogram of my 'self-regarding sentiment' forms part of my 'future' interest-system.

³ See above, p. 233.

neurograms will generally be those that lead to the Rolandic cortex, unless my neurography contains other paths of lower resistance or unless I make new paths by repeated efforts of Will. If, however, I possess a single wide interest, paths of low resistance will link up all my neurograms to one another and so make it easier for me to look before I leap. Indeed, we have already seen that a single wide interest facilitates reasoning; and this is a particular case of the more general proposition that, by resisting the tendency to premature action, to distraction, and to 'fading out', it fosters thinking that is thorough, profound and penetrating.

On the other hand, the man whose neurography is made up of several separate and therefore small interest-systems cannot long continue the same train of thought without much effort of Will. His tendency is to translate his thoughts into hasty acts. He is the so-called 'practical' man who, without much reasoning, 'practises the errors of his forefathers'.¹ But the truly practical man is he who acts automatically in minor matters² but thinks out to its conclusion any important course of action before embarking upon it.

§ 2. THE EFFECT OF WILL

Not only does every train of thought tend to lead to action, a tendency which is increased by a single wide interest, but every train of thought *ought* to lead to action.

The world can get no good from anybody's thought unless he translates it into action. In so far as he keeps it to himself,

¹ Professor Sir Arthur Schuster, F.R.S. (*Presidential Address to the British Association*, Manchester, 1915).

² He must not, for example, stop to think what necktie to put on or what fork to use at table, but must do the right thing (in these small matters and others like them) *automatically*—as a matter of habit—without thinking. Cf. W. James, *loc. cit.* Vol. II, pp. 370, 371.

it cannot affect his neighbours. Unless the philosopher sets forth his conclusions in speech or writing, or perhaps in his behaviour, his philosophy will influence no one but himself. Unless the man of science publishes his discoveries, or otherwise acts upon them, he might as well never have made them. Unless human thought has a practical outcome, human progress is impossible. The same ground will be covered over and over again by different thinkers.

It is no less true, if not quite so clear, that the thinker who does not act upon his thought is injuring himself. He misses his chance to deepen the neurogram of his conclusion, so as not to have to solve the same problem a second time. And, since he cannot forego action of some sort, if he will not act according to his thinking he must either act against it or apart from it; and, in either case, he sows the seeds of future conflict. Again, every time a train of thought fails to complete itself in action, habit makes it easier for the same thing to happen whenever the same thoughts, or some of them, recur.

It follows that every human being should make it part of his purpose to end his every train of thought by action.¹

¹ Cf. W. James: 'Seize the very first possible opportunity to act on every resolution you make, and on every emotional prompting you may experience in the direction of habits you aspire to gain.'

'No matter how full a reservoir of maxims one may possess, and no matter how good one's sentiments may be, if one have not taken advantage of every concrete opportunity to act, one's character may remain entirely unaffected for the better. With mere good intentions, hell is proverbially paved.'... 'Rousseau, inflaming all the mothers of France, by his eloquence, to follow Nature and nurse their babies themselves, while he sends his own children to the foundling hospital, is the classical example of what I mean'... 'never... have an emotion... without expressing it... in some active way'... 'if we let our emotions evaporate they get into a way of evaporating'. (*Loc. cit.* Vol. I, pp. 124, 125, 126.)

For then his Will must intervene¹ whenever necessary to ensure that all his thoughts shall at last issue in deeds.

This maxim must commend itself to anyone who wants to serve his neighbours, or to economise his thought, or to play a part in life rather than to look on at a drama acted by other people. In particular, whoever professes and calls himself a Christian must seek to be a man of action.² He must use his Will to make his thought show itself in deeds.

To sum up: action not only tends to follow from every train of thought, but all men ought to use their Wills in support of this tendency, both in their own interests and for the sake of their community.

§ 3. THE FIVE LAWS OF THOUGHT

All our five laws of thought have now been stated. They are collected here for easy reference:

1. *To every psychosis there corresponds a neurosis* (p. 87).
2. *Excitement in any nervous arc tends to spread to every other arc that is connected to the first by synapses with thresholds low enough for that excitement to overcome* (p. 92).
3. *Of all neurograms that include arcs of the higher level, the most excited tends to drain the excitement from the others* (p. 104).³
4. *Will can reinforce the excitement in any active neurogram which includes arcs of the higher level and the activity of which is already affecting consciousness* (p. 123).
5. *Action is the natural end of every train of thought* (p. 260).

¹ See above, p. 133.

² See below, p. 289.

³ See also p. 110 for the corollary to the third law.

CHAPTER 15

CHARACTER

§ 1. CHARACTER AND CONDUCT

OUR quest of these five laws has shown us how closely the trains of thought that flit through a man's mind are bound up with the permanent qualities that characterise him. These qualities make up his character. We have now to ask what they are.

Chemists distinguish one substance from another by noting their different behaviour under the same conditions. There is no better way of distinguishing one man's nature from another's than by seeing how each reacts to the same environment, how differently they behave when treated alike. If two men could be found who always did the same thing in the same situation, any attempt to discriminate between them would be as unprofitable as the discussion, which Professor Ostwald supposed to have taken place in the days of empirical cookery, whether the dough was raised by an elf or by a brownie. The two men would be as like as Ostwald's two sprites. In short, if we know how a man will act in all circumstances, then we know that man. A man is characterised by his conduct. Or, as the Sermon on the Mount has it, 'By their fruits ye shall know them'.

Further, if a man will not act neither can he live. It is true that one may survive for a while after losing all power of movement, but such a one is only half alive. What is it then that defines a man by deciding how he reacts, moment by moment, to his ever changing environment?

Action, says our fifth law, is the natural end of every train of thought; and, by our first four laws, a man's thought is determined, apart from incoming sense-impressions, by his neurography and his Will. His actions must therefore be wholly determined by his neurography and his Will, together with sense-impressions arising from outside or inside the body. We know of no other cause for any of his movements.¹ Even reflex and instinctive actions, and others that do not follow upon conscious thought, are determined, apart from external stimuli, by the neurography. So also are the 'group factors' described in Chapter 7 above. If then a man is known by his acts, all the available facts are summed up in the statement that his character is fixed when his neurography and his Will are determinately known.

Since, however, we assumed, in our search for the fourth law, that the working of a man's Will is free and unforeseeable, we cannot be sure that it has any other quality save only its strength that can characterise him. So we assume, as the simplest hypothesis consistent with all the known facts, that *every person is characterised only by (1) his neurography and (2) the strength of his Will.*

It follows that a historian, because he has a different neurography from a mathematician, must also have a different

¹ It is argued in the text that, if a person's neurography were completely known—if, for example, the conductivity of every element of his nervous system and of the junction between every pair of adjoining elements were ascertained—and if his Will were also completely known, then the nature of his reaction to his environment (i.e. the kind of movement that would result from given stimulation of his sense-organs, inside as well as outside his body) would also be determined in so far as it depends upon himself; but not necessarily in so far as it may be affected by psychical or other influences which, like his own Will, can affect the conduction of his nervous impulses otherwise than by the stimulation of his sense-organs.

character.¹ But that is not to say that the characters of some specified mathematician and some specified historian may not resemble each other far more closely than those of two historians, or of two mathematicians, selected at random.

That a man's character depends in large measure upon his neurography is widely recognised. Thus 'Herbart maintains that instruction supplies the only force that *can* modify character',² although of course there are parts of the neurography that instruction cannot alter and other parts that it can only reach indirectly.

Morton Prince after asking 'What makes character?' answers: 'The phenomena of disintegrated personality suggest that our characters are wholly a matter of brain associations and that they may be altered for good or ill by anything that will bring about a rearrangement of these associations.'³ Moreover, 'systems of neurograms... become a part of the personality. Such complexes and systems play an important part by determining mental and bodily behaviour. Amongst other things they tend to determine the points of view, the attitudes of mind, the individual and social conscience, judgment, etc., and, as large systems, may become "sides to one's character".'⁴

¹ Cf. Mr H. G. Wells' observation in *Joan and Peter* that a man becomes a different man, however slight the difference may be, when for the first time he learns the law of gravitation.

² Adams, *The Evolution of Educational Theory*, p. 326.

³ *The Dissociation of a Personality* (1906 edition, p. 299).

⁴ *The Unconscious*, p. 535. Prince adds that 'when such complexes have strong emotional tones they may set up conflicts leading to the inhibition of antagonistic sentiments, and sometimes to the contraction and even disruption of the personality. All these phenomena can be induced by the artificial creation and organisation of complexes and this principle becomes an important one in therapeutics'—and, as we shall see, in education also.

That the strength of one's Will is also a factor in one's character used not to be so well understood.¹ But if two men are otherwise alike although one has a stronger Will than the other, the first will surpass the second in any quick mental test when both are doing their best. And, since they are characterised by their actions, their characters must differ because of the difference in the strength of their Wills.

In Chapter 7 we found reasons for supposing that a man's power to concentrate his attention, the power that we called 'Will' in Chapter 6, is measured by his general factor, *g*. Our first reason was that both his Will and his *g*, but they alone so far as we know, enter into every quick test of his intelligence. We explained, however, that our identification of *g* with strength of Will was only provisional. It is, on this understanding that we take *g* to be the measure of Will. But neither the hypothesis stated in italics in this section (p. 275) nor the consequences deduced from it in the following pages depend for their validity upon strength of Will being the correct psychological interpretation of *g*.

§ 2. A STRONG CHARACTER

If, then, character is made up of neurography on the one hand and (strength of) Will on the other, what sort of a neurography and what strength of Will ought to mark the members of a perfect community or commonwealth?

About strength of Will there can be no question. It is

¹ William Stern (*Allgemeine Psychologie*, The Hague, 1935) regards character as the product of a long continued process of growth and organisation through which the innate conative neurograms are built up into a more or less integrated and harmonious system which plays a great part in all volition; and this organisation is largely achieved by self-conscious striving. See McDougall's survey of *The Organisation of the Affective Life*, 1937 (*Acta Psychologica*, Vol. II, No. 3, p. 247).

plainly for everyone's good that a man whose neurography is perfect, and who therefore always sees the right thing to do and wants to do it, should be able to make an effort of Will strong enough to overcome the mental and material obstacles in his way. The stronger his Will is, the better for him and for his commonwealth.

But what is the perfect neurography? That is the question we discussed in Chapter II. Our answer was 'a single wide interest-system'. We saw¹ how a single wide interest would integrate the mind, linking up wide and diverse experience with expert knowledge and skill, and putting it all under the sway of a master-purpose in harmony with the purposes of other members of the same community. We said² that each man's single wide interest resembles the endarchy of knowledge as nearly as possible, particularly its central essences and those essences of the realm of facts with which his work has most to do. And we observed that a single wide interest would make for efficient reasoning, freedom of action, consistent behaviour, enhanced power of Will, and perhaps also sound judgment in matters lying outside the realm of ascertained fact.³

Such qualities, and notably consistent conduct combined with a strong Will, mark the strong man, the man with a strong character. The weak man, on the other hand, lacks coherence between interests and unity among his purposes. He 'has not so much as a purpose, but has only purposes',⁴ as Carlyle wrote of the feeble government at Versailles in 1788. Or, as Professor Déjérine and Dr Gauckler say of the

¹ See above, p. 236.

² On p. 233 above.

³ Above, p. 222.

⁴ *French Revolution*, Ashburton edition, Vol. I, p. 101.

neurasthenic, 'He does not lack interest, but rather he is interested in too many things'.¹

§ 3. A GOOD CHARACTER

Anyone who possesses a single wide interest and goes on developing it with the aid of a strong Will sees the whole world of his experience as a single whole. His view of the universe, showing it organised and showing it whole, is plainly a philosophy. But his outlook on life is more than a philosophy, for it focuses everything in one supreme purpose. This purpose touches his philosophy with deep emotion² and transforms it into a religion, whether good or bad.

All the citizens of an ideal commonwealth must, therefore, be religious; and the central essence of all their religions must be the same, since the master-purposes of all the citizens are to be in harmony with one another. But that does not mean that they must all accept in its entirety the same system of theology or ethics.

This conclusion repeats the teaching of thinkers and seers down the ages. Pericles believed that, if his dream of 'a united Greece with Athens as its eye' were ever to come true, it must have behind it a religious motive. Modern America echoed ancient Greece when William James began his lectures on 'Pragmatism' by quoting with approval G. K. Chesterton's paradox that 'the most practical and important thing about a man is still his view of the universe... the question is not whether the theory of the cosmos affects matters, but whether in the long run anything else affects them'.³ 'Education without religion seems to me impos-

¹ *Psychoneuroses and the Treatment by Psychotherapy*, translated by Smith Ely Jelliffe, M.D., Ph.D.

² See above, pp. 165, 167.

³ G. K. C. in his preface to *Heretics*.

sible'¹ wrote Sir Stanley Leathes when he was Chief Commissioner for the Civil Service. And, in the words of the present Archbishop of York, 'The only religion worth having is one that colours and governs the whole of life and thought'.²

In Chapter 12 we saw that the Will has a vital part to play in developing a single wide interest,³ notably those parts of it that resemble most closely the realm of facts; and, without an effort of Will, no one can organise the central and deepest elements of his neurography on the lines laid down above.⁴ This effort of Will—that makes or helps to make what is at once the fundamental hypothesis and the master-purpose⁵ of the possessor of a single wide interest—is an act of faith. Faith, then, is a matter of Will. Without an effort of Will there can be no faith. Passive acceptance of unverified dogma is not faith at all, but credulity. It is true, of course, as William James has shown in his *Varieties of Religious Experience*, that the fundamental hypothesis and central purpose of a single wide interest may come involuntarily by inspiration,⁶ just as happens with scientific discoveries.⁷ But even so, an effort of Will is needed to *act* on it

¹ Cf. *Spens Report*: 'In view of the paramount part that health of mind and body play in the happiness of every individual, we should have placed Religious Education . . . and Physical Education, in its widest sense, in the forefront . . . of the curriculum' (p. 170).

² *Presidential Address to the Education Section L of the British Association* (Newcastle, 1916).

³ See especially, p. 251.

⁴ See p. 233.

⁵ See above, pp. 232, 233.

⁶ See § 4 of Chapter 12; and footnote 4 on p. 251.

⁷ Cf. James Clerk Maxwell: 'The experimental investigation by which Ampère established the law of the mechanical action between electric currents is one of the most brilliant achievements of science. The whole, theory and experiment, seems as if it had leaped, full grown and full armed, from the brain of the "Newton of electricity".' (*Electricity and Magnetism*, Vol. II, Chapter III.)

and so to verify it.¹ And this act of faith is the first step towards religion.²

The centre of a single wide interest must be rich in future interest since it constitutes a purpose, or even a system of purposes.³ A man whose main purpose for the time being concerns the immediate future rather than a future more remote may indeed achieve great things, although his record is likely to be marred by grave faults. But in his old age he will look back upon his former purposes and realise that his life has not been a success: whatever else we are intended to do, said Robert Louis Stevenson, we are not intended to succeed. His latter years at least will lack the direction of a master-purpose such as belongs to a single wide interest. Nor at any time could a purpose for the immediate future represent the highest good conceivable or the central truths of the universe.⁴ The master-purpose in a single wide interest must concern what lies beyond our present bourn of time or space.

Our commonwealth in this respect resembles More's Utopia where, in J. R. Green's words, 'the disbelievers in a Divine Being or in the immortality of man, who, by a single exception to its perfect religious indifference were excluded from public office, were excluded, not on the ground of their religious belief, but because their opinions were deemed to be degrading to mankind and therefore to incapacitate those who held them from governing in a noble temper.'

A man's emotions are apt to be stirred by a deep interest in the future.⁵ The possessor of a single wide interest is in this case. As he looks forward to the goal of his desire, he is

¹ See § 5 of Chapter 12.

³ See above, p. 233.

⁵ See above, pp. 165 and 229.

² See above, p. 234.

⁴ See above, p. 232.

apt to feel some measure of hope or of despondency; for these 'prospective emotions of desire' or 'derived emotions'¹ are experienced in the course of the working of any strong desire or instinctive impulse. If the central truths of the universe are linked in his mind with his idea of the highest good in the manner described on p. 231 above, it is plain that his 'derived emotion' will be confidence or hope rather than anxiety, despondency or despair. In any case, no one can help hoping that his purposes will be realised. *Of course* I hope to achieve my purposes. If I did not, they would not be my purposes. When my hope gives way to despair, I know I cannot reach my goal, and I cease to try. Why is it, asked a small boy, that you can run faster when you are not last in a race?

In short, whoever possesses a single wide interest is bound to hope for the fulfilment of his master-purpose. 'At bottom', says Amiel, 'everything depends on the presence or absence of one single element in the soul—hope. All the activities of man... presuppose a hope in him of attaining an end. Once kill this hope, and his movements become senseless, spasmodic and convulsive, like those of someone falling from a height.'² And this hope that marks the possessor of a single wide interest is, we repeat, for something beyond his physical death. 'What makes old age so sad', says Richter, 'is not that our joys but our hopes cease.'³

Hope is a public virtue as well as a private gain. Its social value is less than that of brotherly love, but not much less. While there can be no comradeship without love, there can be no leadership without hope. The need for leadership is

¹ McDougall, *Outline of Psychology*, pp. 338–41. See above, p. 67.

² Amiel, *Journal Intime*, 5 juin 1870, quoted by Shand, *Foundations of Character*, p. 479.

³ Richter, *Titan*, quoted by Shand, *loc. cit.* p. 479.

plain enough in any society that is to be reckoned as good. In the perfect commonwealth leadership is indispensable. And certainly no man will ever lead his fellow-citizens to work with him for a remote goal, which he sees more clearly than they do, unless his own confidence inspires them with hope that, under his leadership, they will achieve their common purpose.

We have now got so far as to see that the citizen of the perfect commonwealth should have a single wide interest supported by a strong Will; and that he will then be religious, lacking neither faith nor hope. Such an one has a strong character. His thought and conduct will be consistent and effective. Since his master-purpose is in harmony with those of his fellow-citizens, his thought and conduct will also be congruous with theirs; and thus far we have relied upon harmony of purpose to attain this end.

Since, however, a single wide interest only ensures a perfectly integrated mind 'as nearly as the conditions of human life permit',¹ other tendencies may be at work to impair co-operation between one citizen and another. Like other people, they inherit selfish animal instincts, and the self-sentiment, bound up as it is with every purpose,² has its place near the centre of a single wide interest. So, when some of them set out to climb Everest, innate selfishness is not wholly swallowed up in unity of purpose. Members of the expedition do not spend all day climbing. Cooking and washing-up take up time and energy. Although each of the climbers may have so organised his thought that he involuntarily subordinates his selfish motives to the common purpose

¹ See above, p. 236.

² Cf. McDougall: 'character goes to pieces and volition is undermined, if self-respect is destroyed' (*Outline of Psychology*, p. 442).

of getting to the top of the mountain, he may not have learnt to think of his companions' minor comforts before, or along with, his own. He may not have learnt to think of his neighbours as himself. He may still have to learn 'not to think of himself more highly than he ought to think, but so to think as to think soberly',¹ as St Paul has it; or, as St Peter says, 'with humility'.² Or, to put it another way, although the common purpose of the expedition may secure for each of its members *freedom* to do as he likes (because what he most wants to do is what the others want him to do for the sake of them all), he may not have learnt to treat the others in all things as himself: to treat them, that is, with *justice* or, as the Samoans say, with love.³

How then are minor conflicts to be avoided among fellow-citizens who possess indeed single wide interests dominated by central purposes in harmony with one another but whose minds are yet only imperfectly integrated? There is no other way than to ensure that the affective elements in the central purpose system of each citizen cause the master-purpose that he shares with his neighbours to prevail over his selfish tendency to prefer himself to them. But his self-regarding sentiment is, we know,⁴ closely linked to his central purpose. So also, therefore, must be his sentiment for each and all of his fellow-citizens.

¹ Rom. xii, 3.

² 1 Peter v, 5.

³ Cd. 9210, a White Paper describing 'the attitude of the German Colonies as to their future government', quoted in *The Times*, 12 December 1918. In Samoa, the leading chiefs from every district stated that they were unanimous in wishing that Samoa should remain under British rule, and gave as one of their reasons: 'Because the British officials since the occupation have treated them with love (justice), and they now win cases in the Courts, which was unknown formerly.'

⁴ See above, pp. 157 and 164.

The point is that each citizen's thought of his neighbour's good is to be as direct and immediate as his thought for himself. If his thought for his neighbour has to follow a train of reasoning before it ends in action, while his impulse to act on his own behalf is spontaneous, his behaviour will be sure to show less consideration for his neighbour's interests than for his own. The perfect citizen will not argue to himself: 'If I am unkind or unjust to so-and-so, he will be upset and will work less hard for our common purpose; *therefore* I will treat him with justice or even with kindness.' But his thought will be: 'I will do all I can for so-and-so because he is a friend of mine or, quite simply, because I love him.' On that thought he will act. It is not, for him, a question of duty, but of comradeship or love. In the words of St John's first letter, 'He that loveth not his brother whom he hath seen, how can he love God whom he hath not seen?' How can he serve his master-purpose that is centred in God who is love?

The nature of the sentiment which each citizen should have for his neighbours is therefore plain enough. There can be no doubt which of the great primary emotions, in McDougall's list of them on p. 67 above, this sentiment links up with its object. This emotion can only be ἀγάπη, love or tender-emotion, brotherhood or comradeship. No other instinct save that linked with ἀγάπη would be able to overcome a man's selfish motives when they are opposed to his interest in his neighbour's welfare.¹

¹ But the sentiment of love, 'rendered habitual by repeated evocation, grows more complex and becomes the source of many and various emotional experiences, in which the primary and secondary emotional qualities are blended with the derived emotions in a multitude of different combinations' (McDougall, *Outline of Psychology*, p. 423).

It is this sentiment of love or brotherhood or comradeship that Sir Alfred Zimmern has called the principle of the Commonwealth.

The inspiration (he writes) of all sound and enduring political and social construction is what has been called the principle of the Commonwealth.... A Commonwealth is community, designed to meet the common needs of men, founded on the principle of the service of each for all... the perfect Commonwealth... is a society of free men and women, each at once ruling and being ruled, each consciously giving his service for the benefit of all.

The principle of the Commonwealth is the application to the field of government and social policy of the law of human brotherhood, of the duty of man to his neighbour, near and far.... A Commonwealth is an organisation designed with the ruling motive of love and brotherhood. It seeks to embody, not only in phraseology and constitutional doctrine, but in the actual conduct of public affairs, so far as the frailty and imperfection of man admit, the spirit and ideals of religion. *Whosoever will be great among you shall be your minister; and whosoever of you will be chiefest shall be the servant of all.*

The doctrine of the Commonwealth expressed in these words has been set forth and applied from age after age to the current problems of humanity, from Plato down to President Wilson.¹

Now we are trying to describe a 'good', or even a perfect, character. We found in Chapter II how the single wide interests of different people ought to vary with the several parts they play in the life of their community. We also saw that, despite these differences, the purposes governing each man's life should be in harmony with those of his fellow-

¹ *Nationality and Government*, by A. E. Zimmern (1918), p. 355.

citizens. Their master-purposes, we said,¹ should be the same. On this, as we have just remarked, individual freedom depends. Only so can conflict be avoided between men and women whose welfare, both material and spiritual, depends upon all of them working together for the good of each.

But which community will best serve the interests of all its members? Which will, in proportion to its size, produce most material wealth, and in greatest variety? Which will be able to spare the largest fraction of its people from the labour of producing and distributing material goods so that they may engage instead in discovery, in teaching and in government? Which will best avoid the danger of conflict with some rival society outside it: a conflict that may put an end to the freedom of its citizens, confound their purposes, kill or maim their bodies, and perhaps destroy their civilisation? There can be no doubt about the answer. The only perfect community or commonwealth is one that embraces all mankind.

It follows² that humanity as a whole must lie as near as his own self to the centre of interest of every citizen of this World Commonwealth. Since, however, his thought must be true, the central essences of his single wide interest must represent the central truths of the universe, the central essences of the endarchy of knowledge.³ If then the perfect character that makes for *freedom* and for *justice* is to be attained without sacrificing *truth*, humanity must be central in the endarchy of knowledge. Mankind must be one of the most valuable facts in the universe.

¹ On p. 231.

² From the last sentence on p. 284.

³ See above, p. 228.

Can it be that Man, a tiny part of a petty planet of a middle-sized star, one among millions, really is as important as all that? We can only tell if we first make up our minds about the central essences of the endarchy of knowledge. To this end we may proceed in either of two ways. The first is by provisionally accepting prevalent opinions, especially of those whose wisdom one respects. The other is by seeking an inspiration on one's own account. Some people will prefer to begin, in the first way, with authority; and some, in the second way, with private judgment. But whichever way I choose to begin—whether my hypothesis concerning the most valuable truths of the universe, the ultimate essences at the centre of knowledge, be the prevalent opinion or my own inspiration—I must go on to *act* upon it. Only so can I hope to verify it; or, if need be, to alter it until it fits all my experience and so much of the experience of other people as I can distil from their accounts of it.

§ 4. THE CHRISTIAN HYPOTHESIS

The Christian account of the central essences of our world deserves special notice, because it enables all the conditions for a perfect character to be fulfilled. Whoever holds the Christian faith may have all the qualities of a perfect character without contradiction between them. The Christian philosophy does not differ from scientific thought in its conception of the realm of facts. But it rounds off the endarchy of knowledge with a hypothesis concerning those undiscovered essences that are the most central and the most valuable¹ of all.

Of course it is conceivable that, as scientific thought

¹ See above, pp. 200, 205, 232.

proceeds towards its goal, it may formulate or discover central essences incompatible with those declared by the Christian faith as it exists to-day. But we are not to wait and see; for unless some people formulate for themselves or accept from others, and in either case *act on*, a hypothesis concerning these central essences, they never will be discovered. And, unless every man makes or takes some hypothesis concerning the central truths and acts upon it, he cannot have a single wide interest or a perfect character.

We remind ourselves that a perfect character comprises a single wide interest and a strong Will.¹ This single wide interest looks upon the world of experience not merely as the realm of facts, the world as known piecemeal to scientific thought, but as the completed endarchy of knowledge, integrating the known world into a *single whole*² by means of a working hypothesis.³ *Faith*,⁴ implying an effort of Will, is needed to act upon this hypothesis in order to verify it or perhaps to find out where it needs to be altered to fit experience. Then again the single wide interest is centred at the same time in a *master-purpose*⁵ dominating the life of its possessor. *Hope*⁶ for something beyond the end of life in the flesh is an inevitable concomitant of this dominant purpose. The master-purpose, shared by all, ensures *freedom*⁷ to each. The driving force behind it is a sentiment of *love* or *comradeship*⁸ for one's fellow-men that adds *justice*⁷ to liberty. And, if *truth*⁹ is not to be sacrificed to liberty and justice, *mankind*¹⁰

¹ See above, p. 278.

³ See above, p. 217.

⁵ See above, pp. 231-6.

⁷ See above, pp. 284 and 287.

⁹ See above, p. 287.

² See above, p. 236.

⁴ See above, pp. 280, 281.

⁶ See above, pp. 282, 283.

⁸ See above, pp. 285, 286.

¹⁰ See above, p. 287.

must somehow be central in the scheme of things, one of the most valuable and important things in the universe.

All these dry bones are brought together, 'bone to his bone',¹ and made to live by the Christian faith.

In the first place, the central, most important, and most valuable essence of the endarchy of knowledge is an integral part of all other facts and links them all together. Christianity, as we have already seen,² describes God as having this relation to all the ultimate facts of the universe: He is in all things, and all come from Him. This view of the world as it ought to be, as it will be when the present elements of disorder and inconsistency have been done away, was taught by the founder of Christianity. His earliest disciples described his teaching as the gospel of the kingdom of God. We shall use the same phrase—the kingdom of God—to describe the endarchy of knowledge completed by the Christian hypothesis. 'The ideal world of conceptual harmonisation', says Whitehead, 'is merely a description of God himself... the kingdom of heaven is God.'³

Secondly, Christianity asserts the vital importance of active *faith* if one is to have and to hold this conception of God and his kingdom. 'Without faith', says the writer of the epistle to the Hebrews, 'it is impossible to please' God.⁴ And the faith that is the first step towards knowing God is no passive acceptance of unverified dogma but *action* on a hypothesis—the Christian hypothesis—with a view to verifying it. It is true that this faith, on which Christians have always laid so much stress that St Paul wrote of being 'justified by faith',⁵ is often

¹ Cf. Ezekiel xxxvii, 7.

³ *Religion in the Making* (1927), p. 138.

⁵ Rom. v, 1.

² On p. 231 above.

⁴ Hebrews xi, 6.

supposed to be merely passive. But this view is surely mistaken. When St Paul told his jailor at Philippi 'Believe on the Lord Jesus and thou shalt be saved'¹ he meant 'Go and *act* upon the fundamental hypothesis of Christianity—that there is a God and that Jesus knew him and taught the truth about him—and your action will convince you of the truth that you assumed, and at the same time will lead you to love your neighbour and to love God, whom to know is life eternal'. But if St Paul did not always insist that the Christian faith was essentially active, Jesus had no doubt about it. He summed up the law and the prophets in the golden rule: 'Whatsoever ye would that men should do unto you, even so *do* ye also unto them.'² He made the same point abundantly plain in parable after parable. For example, in the story of the sheep and the goats, he made the difference between the saved and the unsaved to consist only in the fact that the former had actively served their fellows while the latter had not: no question was raised about their passive beliefs.

It is indeed remarkable that, while Jesus insisted on the paramount importance of active service to one's neighbour,³ his followers, hardly less than his critics, have thought of his religion as if it were negative instead of positive and creative, as one of suppression rather than expression. They have laid stress on the need for leaving undone what ought not to be done instead of on the need for doing what ought to be done. Yet it was Jesus who summed up the ten commandments without saying 'thou shalt not'. The medieval saints

¹ Acts xvi, 31.

² Matt. vii, 12.

³ This is the 'conative element' in Christianity corresponding to the 'emotional element', brotherly love or comradeship.

who cut themselves off from the world, and harmed their bodies to save their souls, were far from following in the steps of him who went about *doing* good. The Christian life certainly involves self-denial. But it is secondary, incidental. The things given up are crowded out by action. And activity, especially, in the service of God and man, is a source of pleasure rather than of pain.

Thirdly, Christianity insists that every man's thought and conduct must be subject to a *master-purpose* intimately linked with the central essences of the universe and therefore, according to the Christian view, with God. 'Seek ye first his kingdom'¹ was Christ's exhortation to his disciples to let their lives be governed by a single master-purpose. If men are to seek first the kingdom of God, they must change their outlook on the world, rearrange their minds,² organise their thought afresh. But it is not enough to contemplate the ideal world. Men must help to make the world perfect. Their chief business, their supreme purpose in life, must be to know God, to share his purpose, to take part with him in creation, to help him to build his kingdom, particularly on earth and in the minds of men. The world, as we know it, includes mankind; and among its human affairs it does certainly contain elements of disorder and inconsistency which no amount of analysis, abstraction and classification (such as are used³ in organising thought about the world as it is) can get rid of altogether. They constitute, according to Whitehead, the problem of evil. But they have no place in the kingdom

¹ Matt. vi, 33. The kingdom of God includes—or even *is* (see above, p. 290)—God.

² This, rather than 'repent', is the literal translation of *μετανοεῖν*.

³ See above, Chapter 10.

of God, in the world as it ought to be, or, as the Christian believes, in the world as it will ultimately become. This realm of ultimate facts, the endarchy of knowledge, as interpreted by Christianity, is the world as it ought to be. It is also the world as it will be when scientific thought and Christian purpose together reach their goal.

In the fourth place *hope*—hope of salvation,¹ hope of eternal life²—was an essential element in the faith of the early disciples.

Fifthly, the master-purpose, shared by all Christians, implies, as we saw, *freedom* within any Christian community. 'Ye shall know the truth, and the truth shall make you free.'³ 'As many as are led by the Spirit of God', the central purpose which is God, 'they are the sons of God';⁴ and 'where the Spirit of the Lord is, there is liberty'.⁵

Sixthly, Christianity makes *love*, ἀγάπη, or *comradeship*⁶ supreme in the kingdom of God. God himself is love: ὁ Θεὸς ἀγάπη ἐστίν.⁷ Christianity thus supplies⁸ the dominant emotion in the Christian character, and intimately links this emotion with the master-purpose of seeking to know God and to promote the coming of his kingdom. For, if God is love, one cannot know God without loving. Any attempt to form a neurogram of God in the centre of a single wide interest-system and to omit from it this affective element that waits on all loving thoughts and deeds would ignore the very essence of God. If, then, we accept the fundamental

¹ 1 Thess. v, 8.

² Titus, iii, 7.

³ John viii, 32.

⁴ Rom. viii, 14.

⁵ 2 Cor. iii, 17.

⁶ ἀγάπη is *brotherly* love. It is to be distinguished from ἐρως, which is sexual love or desire.

⁷ 1 John iv, 8.

⁸ One cannot reflect upon the character and conduct of Jesus, and especially upon his passion and death, without loving him.

teachings of Christianity as our central hypothesis, we must not only seek to know God, but we must also love him and all men, fulfilling Jesus' summary of the commandments: 'Thou shalt love the Lord thy God . . .' and 'Thou shalt love thy neighbour as thyself'.¹ As was said two pages back, we are here both to know God and to fulfil his purposes. Knowing God, loving God, and keeping his commandments² all go together.

Seventhly, we have seen how the golden rule is the root of *justice* as the common purpose is the spring of liberty.

Lastly, Christianity yields justice and liberty without sacrificing *truth*; for the Christian hypothesis places man—not any particular race or group of men,³ but *mankind* as a whole—close to God at the centre of all things. Jesus taught his disciples to call God their 'Father'. He spoke of himself sometimes as the Son of Man, sometimes as the Son of God. And Christian theology sees three essential aspects of God: the Spirit, in man; the Son, as the link between man and God; and God himself, the central essence of all.

So we see how the Christian faith brings together the dry bones of theory and gives them life, clothing them with feeling and with purpose.

But we must be careful to distinguish the fundamental teachings of Christianity from the frills that have gathered round them. We must not confuse the foundations of the Christian church with its gargoyles. If, as we said, that is true for any man which fits his personal experience and so much of the experience of others as he can disentangle from their accounts of it, there is good reason to expect that whoever

¹ Matt. xxii, 37 and 39.

² Cf. I John v, 3.

³ Cf. the parable of the good Samaritan.

will begin to act on the hypothesis that the essentials of Christianity are true, will find his hypothesis fit his experience and so will verify it. But his experience, as it grows, is likely to lead to minor changes in his first guess at the truth. His Christianity will thus be sure to differ in non-essentials from that of any other Christian. Indeed it must, if it be a living faith, grow from day to day and from hour to hour.

And if the Christian faith provides, so far as we can see, the best of all hypotheses on which to build a World Commonwealth and the perfect characters of its citizens, we do well (since we are not to wait and see if some other way presents itself)¹ not only to accept it and act upon it ourselves, but also to commend it to others, and particularly to our pupils, reminding them the while that 'religion is not theology nor yet ethics, but personal and experimental'.²

¹ See above, p. 289.

² Dr Stanley Hall, *Adolescence*, Vol. II, p. 326.

CHAPTER 16

THE AIM OF EDUCATION

AGREEMENT on the aim of education is not to be expected while men differ widely about the meaning and purpose of life.¹ But, in the light of our last chapter, it appears to us that the aim of education should be to develop single wide interests (and, if possible, to strengthen Wills) so as to form characters of the kind we have described, characters that will fit their possessors to give God and his world the best service of which they are capable and to realise their own best selves in that service; or, in four words to which our inquiry has lent precise significance, 'To form Christian characters'.

The single wide interest fashions a man's whole nature and nurture into a unity of knowledge, feeling and impulse. It controls all his thought and action. It consists, as we saw in Chapter II, of a dominant centre, an intermediate zone of definite knowledge and skill, and a fringe of comparatively unorganised experience.

The intermediate and outer zones of such a mind, a mind as perfectly integrated as the conditions of human life permit,² have been described in Chapter II. We here recall that, although all single wide interests, and Christian characters in particular, will include some idea of the world as an ordered whole, of God and his universe, of 'the endarchy of

¹ Cf. Professor J. Welton, *Encyclopedia Britannica*, 11th edition, article on 'Education'; and *Spens Report*, p. 147.

² See above, p. 236.

knowledge', they are not to be all alike. The many members of one body have not all the same office. Division of labour is needed if the master-purpose of all Christians is to be fulfilled, even as it is required for many of the minor purposes of every civilised community. This difference of function must depend in part upon innate differences between individuals. But education must prepare for it, by selecting pupils according to their several natures to acquire whatever kind of special knowledge and skill will best fit each of them 'for the service of God in Church or State' and, as we said, for realising their best selves in that service.¹

The dominant centre of a single wide interest is both a master-purpose and a guess—maybe an inspired guess—at the most important, most valuable, and most central fact in the universe.² Only if this central fact has the nature of a purpose can such a guess attain truth.³ Since, however, the central fact⁴ can only become known by acting on *some* hypothesis so as to verify it, we advised beginning with the Christian faith. That faith (unlike the so-called 'ideologies' of National Socialism, Fascism, or Communism⁵) assimilates the common goal of its adherents to the central mystery of the physical universe; for it holds that both are the glory of God.

¹ Cf. *Report of the Royal Commission on Secondary Education* (The Bryce Commission, 1895): 'Secondary education, therefore, as inclusive of technical, may be described as education conducted in view of the special life that has to be lived with the express purpose of forming a person fit to live it' (p. 136). See also above, p. 296, and *Spens Report*, p. 152.

² See above, p. 232.

³ See above, pp. 229-32.

⁴ In common, of course, with all the other undiscovered essences of the endarchy of knowledge.

⁵ Each of these philosophies is thus ruled out as a basis for education that aims at a single wide interest. See above, p. 232.

It may be said that faith cannot be taught, but can only be caught. But both processes belong to education, properly conceived: education that kindles the undying fire and inspires with the spirit of God.

The master-purpose, dominating the Christian character, is to know God and to promote the coming of his kingdom by helping to create the perfect world, by discovering and *changing* the realm of facts until the goal of scientific thought is reached and the evil is removed from the world as we now know it.¹ But, as we saw,² the highest good of all can only be attained in a world-wide commonwealth of Christian people. The Christian is compelled by his master-purpose to aim at this practical expression of his belief in the fatherhood of God and the brotherhood of men. And, as we have also seen, the Christian faith, when enough citizens of a World Commonwealth have been educated to share it, brings with it hope, comradeship, peace (freedom from external conflict), liberty (freedom from internal conflict), justice and truth.

¹ Thus the present realm of facts becomes at last the perfectly ordered and complete realm of *ultimate* facts that we have called the endarchy of knowledge.

² On p. 287 above.

CHAPTER 17

THE PRACTICE OF EDUCATION

§ 1. THE *TEACHERS' DECLARATION* AND THE *SPENS REPORT*

EIGHTEEN years ago an earlier attempt by the present writer to work out and set forth principles of education was followed, in the same book,¹ by a survey of the changes needed to apply these principles in the schools and universities of England. This programme had already been summed up in a series of Recommendations² made by the Federal Council of Lancashire and Cheshire Teachers' Associations³ in 1919. Most of the proposals then made have since been endorsed by the Consultative Committee of the Board of Education in the *Hadow Report*⁴ and the *Spens Report*.⁵ Moreover, all the great associations of teachers have

¹ *Education and World Citizenship* (Cambridge University Press, 1921).

² Some of these Recommendations are reprinted below, pp. 338 *et seq.*

³ The Recommendations were published by the Manchester University Press in 1920 with a diagram, a prefatory note and an introduction by the present writer, then Chairman of the Federation. The following bodies were represented on the Council: Victoria University of Manchester, University of Liverpool, Headmasters' Association (Twelfth Division), Headmistresses' Association (Lancashire, Cheshire and Derbyshire Branch), Assistant Masters' Association, Assistant Mistresses' Association, Private Schools' Association, National Union of Teachers (Lancashire and Cheshire Branches), Association of Head Teachers (Lancashire Branch), Association of Teachers in Technical Institutions (Lancashire Branches), National Society of Art Masters (Lancashire Branch), together with teachers of Domestic Subjects, of Manual Training, and of Music, and the Half-Time Council.

⁴ *The Education of the Adolescent*, 1926.

⁵ *Secondary Education with special reference to Grammar Schools and Technical High Schools*, 1938.

accepted the thesis that one of 'the chief purposes of education' is to build up 'the "single wide interest" on which strength of character largely depends'.¹

These associations, in 1927, presented a memorandum to the President of the Board of Education, Lord Eustace Percy, on *The Schools of Britain and the Peace of the World*. Its original signatories included the National Union of Teachers; the Educational Institute of Scotland; the Headmasters' Conference; the Incorporated Associations of Headmasters, Headmistresses, Assistant Masters, and Assistant Mistresses; the Training College Association and the Council of Principals of Training Colleges. Other bodies of teachers have since signed the document. Among the 'chief purposes of education' described in this memorandum are to impart knowledge that is 'practically useful', belonging to the work-system² or intermediate zone of the single wide interest; and to provide 'a strenuous intellectual discipline'.³ One of the reasons given in the memorandum for including the study of world affairs in the curriculum is that this kind of knowledge 'links up so many other studies. The beginnings of disconnected subjects are elementary. Below the surface lie more abstract conceptions, generally more valuable⁴—and more difficult.' And the paper adds: 'We recognise that new knowledge alone, without some change of feeling and of purpose,⁵ will not suffice....'

¹ See the Memorandum—known as the *Teachers' Declaration*—described in the next paragraph.

² See above, pp. 224 *et seq.*

³ See above, pp. 150–53, where a strenuous intellectual discipline is advocated as a means to increase the group factor 'w', or purposefulness, and, if possible, to strengthen 'g'.

⁴ See above, pp. 201 and 210.

⁵ See above, Chapter II, especially p. 223.

§2. WHY STUDY THIS OR THAT?

The reasons why this or that subject ought to be studied by this or that pupil are examined in Chapter 11 and at the end of Chapter 7 above. The chief reasons are those noticed in the *Teachers' Declaration*. Briefly, in order to merit a place in the school curriculum, a subject must help to build a single wide interest by linking up the pupil's knowledge, his feelings, and his purposes; it must be practically useful, so that its neurograms deserve their places in his work-system; and it must provide a strenuous intellectual discipline.

The *Spens Report* takes the same view, except that it stops short of the last discovery, for it fails to point to the single wide interest¹ at the end of the road it explores so well. It does not insist that coherence at seventeen is often the surest way to comprehensiveness at twenty-seven.

The Report is, however, clear that John matters more than Latin; that the value of a subject depends on the boy or girl to whom it is proposed to teach it;² that the facts taught to a pupil are not to be learnt for their own sake;³ that they

¹ The Report comes nearest—and quite close—to stating the need for a single wide interest in the following passage: 'It has been said that "the principal weakness of the secondary curriculum, taken as a whole, is that too often it is not centred round any core, or related to any one main stem of learning, or way of looking at life". We believe that this is true' (p. 173).

² 'The emphasis in educational theory has shifted from the subject to the child' (p. 143). A shift was needed: 'In the philosophy underlying these Regulations—the Regulations for Secondary Schools 1904-5—"the general progressive complete course" is considered without relation to the child' (p. 71). See also above, p. 4.

³ 'It is not what a pupil knows but what he does and how he lives that really matters' (p. 171). 'Unless facts are utilisable and intended to be used they serve no purpose' (p. 173). 'To speak of secondary school studies as "subjects" is to run some risk of thinking of them as bodies of facts to be stored rather than as modes of activity to be experienced' (p. 152). See also above, p. 12.

should be as closely related as possible to each other¹ and to the feelings and purposes of the pupil so as to build sentiments and interests;² that, therefore, as we said on p. 221 above, several separate subjects (such as are all too frequently taught out of relation with one another in preparation for the School Certificate Examination³) are of far less value than a coherent curriculum. All this, while it just falls short of our ideal of a single wide interest, and while much of it has still to be accepted by the Board of Education, is in its entirety a prodigious advance on any previous pronouncement from Whitehall.

In regard to the other two qualifications of a subject for a place in the curriculum, the *Spens Report* goes with us the whole way. The Consultative Committee recognises that

¹ 'We think that the school itself should adopt a unifying principle in its curriculum' (p. 173). 'For the majority this centre of interest should be found in English and the English subjects' (p. 264). 'The technical subjects which would be taught in [Technical High Schools: the Junior Technical Schools proposed as part of the provision of secondary education in the Recommendations on p. 339 below] are grouped round and built upon a range of systematised knowledge and theory' (p. 284). 'For the instruction of boys, especially when collected in a large school, it is material that there should be some one principal branch of study... to which the principal weight should be assigned, and the largest share of time and attention given' (quoted on p. 28 from the *Report of the Public Schools Commission*, 1864).

² 'We have...learnt the importance of interests or "sentiments" in education' (p. 143). 'The educative effects of any branch of study consist in its suitability...in its invitation to the pupil to form interests or sentiments about a subject' (p. 173). 'If he [the pupil] dislikes the teacher, he may dislike the subject' (p. 132). 'He learns best who learns with interest and with a purpose, or to put it in another way, he learns best who sees meaning and significance in what he learns' (p. 78).

³ 'We...agree...to a reduction in the number of subjects studied at any one time' by secondary school children over 14 years of age (p. 188). 'In many Secondary Schools the Certificate Examination is now the dominant factor in determining the curriculum for the majority of pupils below the age of 16' (p. 80).

whatever is studied in school ought to be practically useful¹ to those who study it; and that it ought to provide a strenuous intellectual discipline.²

§ 3. TWO TYPES OF STUDY

Now it happens that disconnected facts, such as fill the snappy paragraphs of the popular press, are easily grasped. In the same way, it is easy to acquire a superficial knowledge of several separate subjects. Below the surface lie other facts, more general and more abstract, that are harder to under-

¹ 'There is . . . in our view no educational heresy so serious as the belief that culture and practical utility are mutually exclusive' (p. 161). '*Not enough is at present made of the "utility phase"*,'—see footnote to p. 242 above—'*in the development of the pupils' interests*' (p. 163). 'We cannot but deplore the fact that the Board [of Education] did little or nothing after the passing of the Education Act of 1902 to foster the development of secondary schools of quasi-vocational type to meet the needs of boys and girls who desired to enter industry and commerce at the age of 16' (p. 72). 'In the Board's Regulations for Secondary Schools for 1904-5, this "general education" is designed to cover the period between the ages of 13 and 17, and the vocational motive, even in its mildest form, is excluded' (p. 69). The Report quotes the Bryce Commissioners as saying that 'Secondary education, . . . as inclusive of technical, may be described as education conducted in view of the special life that has to be lived with the express purpose of forming a person fit to live it' (p. 60, quoting from the *Report of the Royal Commission on Secondary Education*, 1895, p. 136).

² 'The educative effects of any branch of study consist [*inter alia*] in its suitability and usefulness in providing material for thought, for the perception of relations, for matter on which the pupil may strengthen his powers of reasoning' (p. 173). One reason for including Scripture in the curriculum is that the study of the Bible 'provides a valuable intellectual discipline' (p. 209). The 'systematised knowledge and theory' to be taught in Technical High Schools 'affords an intellectual discipline comparable to that of a grammar school education' (p. 284). As shown on p. 265 above, 'Much of the time . . . now spent in "experimental work" could be better employed' (p. 250).

stand but may be much more worth learning.¹ They are more valuable, not only for being more difficult, but because they can be used so often, like regular conjugations that cover a multitude of verbs. It is far more useful to know one's tables and to realise that two and two are always four—a general and a very abstract fact—than that two arms and two legs make four limbs. It is far more useful to know things that are true of any and every circle than merely to know a few odd facts about a dinner plate or a motor tyre or the earth's equator. It is far more useful, to most people, to understand the working of internal combustion engines in general than to be able to spot particular makes of car.

Indeed, the value of abstract knowledge to boys or girls with many years of school life ahead of them is plain enough. These young pupils will need to use most of the abstract and general facts in their later studies. But it is well to make sure that older pupils, in their last two years at a secondary school, are not wasting their time upon abstractions that will never be of use to them. Their studies, especially those of the abler among them, need to go deep down into the roots of things. But they must be the roots of the *right* things. Nothing is more deadening than to load the mind with abstract ideas that will never be used. Or, as Professor Whitehead observed in his first presidential address to the Mathematical Association:

Education with inert ideas is not only useless: it is, above all things, harmful—*Corruptio optimi, pessima*. Except at rare intervals of intellectual ferment, education in the past has been radically infected with inert ideas. That is the reason why uneducated clever women, who have seen much of the

¹ See the *Teachers' Declaration* quoted above on p. 300.

world, are in middle life so much the most cultured part of the community. They have been saved from this horrible burden of inert ideas.¹

On the other hand, the deep and abstract study of a branch of knowledge which the pupil is going to pursue for some time to come—perhaps at the university—is the only way to become expert in a subject, to master it and be able to use it, to grasp its principles, to understand its laws, and thoroughly to appreciate the beauty of its generalisations.

It follows that, for older pupils, there should be two ways of studying the same subject in the same school: the *deep* way and the *wide* way. The future mathematician or physicist will, for example, find value and delight in deep ideas which would be merely arid technique and excess of detail to the literary boy. Both boys want values rather than facts.² But the same fact has different values for each of them.³ Yet the future scholar needs to know something about, and to feel

¹ *The Organisation of Thought*, pp. 4, 5.

² Cf. the *Spens Report*: 'The accumulation of facts leads too often to a surfeit of inert uncoded knowledge leading nowhere... We do not wish to depreciate the value of information, but unless facts are utilisable and intended to be used they serve no purpose' (pp. 172, 173).

³ See above, p. 200. The value of an essence to a particular pupil depends upon the place it is to occupy in his single wide interest. If it is to form part of his work-system, which should represent every essence of that narrow region of the realm of facts in which he is expert, it will owe its value to the number of essences it unites. The broad principles and generalisations of his subject will have the same relative value for him as they have in the realm of facts. They will occur frequently in his thought and so be of much use to him. But they will not occur frequently in the thought of the non-expert. For him they will only have exceptional value if linked with strong affects, so as to deepen their neurograms. His knowledge of the broad principles of other subjects than his own should indeed be supported by an acquaintance with some examples of their practical working. But the tissue of intervening essences will be unrepresented in his mind. It will thus short-circuit the realm of facts, apart from so much of it as is represented in his work-system.

the wonder¹ of, some of the most mighty achievements of the human intellect, such as are linked with the names of Newton, Clerk Maxwell and Einstein. 'There is, therefore, a need for courses, both in Science and in Mathematics, which shall bring out the essential characters of those modes of creative activity and illustrate the part they play in the business of mankind, but shall be, for certain pupils, alternative to the standard courses.'² In the past 'the teacher of science has followed too closely the example of the classical master. The foundations of the subject are laid with equal care, whether any superstructure is to be erected upon them or not; and it has not been fully considered that a cottage completed and ready for occupation may be of more value to the community than the foundations of a palace which have never been carried above the damp-proof course.'³

In the same way, the boy, who takes more interest in things than in people⁴ should feel the charm of the masterpieces of literature. Wide reading of good translations from languages he has neither the time nor the wish to study deeply will help him here. It is perhaps in wider teaching of this kind, rather than in more formal lessons, that the teacher's part is most important. He can do what books cannot. He can pass on directly to his pupil the emotion which great writing makes him feel.

¹ This will help him to realise that his own speciality, although more valuable to him, may not be absolutely more valuable than his neighbour's. Years ago at Eton 'we touched our hats most deferentially to our "tutors", that is to say, to the purveyors of Latin and Greek instruction, but never to the mathematical masters' (*Fewness of My Days*, by Lord Braye).

² *Spens Report*, p. 158.

³ Dr William Garnett in *Natural Science in British Education*, Ministry of Reconstruction pamphlet 26.

⁴ Cf. the Dean of Durham's book *A Plea for a Plan* (1938).

But whether a pupil should study this or that subject in the deep way or the wide does not depend only on where his main interest lies. It is also a question of how much further he is going to pursue that particular line of study. The boy of sixteen who will become an engineering apprentice within a year or two ought to study mathematics and mechanics in a wider way than another boy of the same age who intends to enter the same industry after taking a university degree.¹ And the studies of the undergraduate who, as a schoolboy of seventeen, was mainly concerned with the deeper facts of his fundamental science, should widen out as the time approaches for him to enter engineering works as a college apprentice. Only by becoming less deep and less abstract towards its end will his engineering course link the rest of his single wide interest with all his scientific and

¹ Cf. *A Study of the Boston Mechanic Arts High School, being a Report to the Boston School Committee*, by Dr C. A. Prosser, published by Teachers' College, Columbia University, New York City, 1915. Dr Prosser found that the school, although intended to prepare boys of 16 to 18 for direct entry into engineering occupations, was trying instead to prepare them for the Massachusetts Institute of Technology or the engineering departments of other institutions of university rank. Dr Prosser wrote: '*The School fails to meet the needs of the 85 per cent of its pupils who do not go to the engineering college, because it serves primarily the 15 per cent who do... The course of study is not the right kind... It is too abstract and too far removed from the practical experiences the pupil will meet when he goes into industry.*' It ought to have been wider and less deep.

The *Spens Report* maintains that the same criticism applies to much of the education given to pupils between fourteen and sixteen years of age in English secondary schools. 'English secondary education has by tradition come to be regarded essentially as preparatory to the Universities or some other form of higher education' (p. 143). 'There is considerable danger both to the individual and to society in looking upon secondary education as only, or chiefly, preparatory to higher... education' (p. 144). '*The studies of the ordinary secondary school should be brought into closer contact than at present with the practical affairs of life*' (p. 162).

technical work and, in particular, with his central purpose of serving God and man as an engineer.

Again, boys or girls of thirteen who will not give up the study of mathematics before they are sixteen may know the Pythagorean theorem almost as it was studied in the days of their grandfathers, who knew it as the forty-seventh proposition of the first book of Euclid. But thirteen-year-old boys and girls who are going to leave school as soon as the law allows, or who are about to have done with mathematical studies, may well accept as an empirical fact that the square on the longest side of a right-angled triangle is as big as the sum of the squares on the other two sides, at least in all the cases they have weighed and measured, and therefore presumably (and they may be content to leave it at that) in every other case as well.¹

§ 4. FORM-MASTERS

We pass from the question whether this or that pupil should study a subject in the deep way or the wide to inquire whether it should be taught by a specialist or by a form-master. It is plain that six or seven separate subjects, taught out of relation to one another, each by its own specialist, are not likely to develop single wide interests in the minds of boys or girls who are not yet old enough to direct and

¹ The difference between the wide and the deep way of studying the same subject may be further illustrated from the personal experience of the present writer. When he was transferred from the classical to the mathematical side of his school he did not begin to study algebra at the stage he had already reached. Instead, he went back to the beginning of the subject and set about mastering abstract conceptions which would have been inert ideas of the mind of a classical boy but which the future student of mathematics would be using almost every day for many years to come.

integrate their own studies. If single wide interests are to begin growing during early adolescence, the pupil's teachers at each stage should be the fewest who can teach him what he needs to know in the way he needs to know it. And when, from time to time, their number has to be increased, the work of teaching him should not be equally divided between them. At least until he reaches the Sixth Form of a secondary school, every pupil should spend the greater part of his working week in studying under, or for, his own form-master.

The form-master will then have the best chance to know his boys, to become their friend, to link up all the knowledge he imparts to his pupils with their growing interest in him and his teaching. And, if he himself possesses a single wide interest so that he sees life clearly and wholly, the links between his own thought are likely to be copied in the minds of his pupils and so give to each of them an interest that is single as well as wide. The form-master at his best has indeed a task worth being enthusiastic for. To convince boys that intellectual growth is noble, and intellectual labour happy, that they are travelling on no purposeless errand, mounting higher every step of the way, and may as truly enjoy the toil that lifts them above their former selves as they enjoy a race or a climb: to help the culture of their minds by every faculty of moral force, of physical vigour, of memory, of fancy, of humour, of pathos, of banter, that we have ourselves, and lead them to trust in knowledge, to hope for it, to cherish it; this, succeed as it may here, and fail there, quickened as it may be by health, and sympathy, or deadened by fatigue or disappointment, is a work which has in it most of the elements which life needs to give it zest. It is not to be done by putting books before boys, and hearing them so much at a time. . . . It is by making it certain to the understanding of every one that we think the knowledge worth having

ourselves, and mean in every possible way, by versatile oral teaching, by patient guidance, by tone and manner and look, by anger and pity, by determination even to amuse, by frank allowance for dullness and even for indolence, to help them to attain a little of what gives us such pleasure.¹

It is true that the form-master, who knows his boys so much better than the specialist teacher can ever get to know them in a few short periods a week, and whose influence over them is so much greater, may be less proficient than a team of specialists in some of the subjects he has to teach. But, after all, 'from the educational point of view, it is not the subject, but the methods of teaching that matter'.² And it is only the younger pupils in a secondary school who should study *all* their subjects in the deep, rather than the wide, way. Their form-master can perfectly well prepare himself to teach them the elements, however abstract, of subjects to which they give so much of their time as they spend working with or for him.³ That will leave them something less than half their time to work with or for specialist teachers.

The form-master of one of the middle forms is in the same case. His boys should either be making a deep study of some group of subjects—it might be the language, literature, history and geography of ancient Greece or Rome—which they hope to go on studying for years to come; or else they intend to leave school soon after sixteen. In the first case, the form-

¹ Edward Bowen, quoted by Sir Cyril Norwood as showing 'the English tradition from the teacher's side at its best' (*The English Tradition of Education*, pp. 91, 92).

² *Spens Report*, p. 173.

³ And yet there are many secondary schools in England where boys of thirteen may not learn history and English from the same master, even when the teacher of history—or the teacher of English—happens to be called their 'form-master' because they keep their books in his classroom!

master may well be expert enough for fifth-form work in the central group¹ of deep studies, or in some of them, and also able to take some of his form's wider work that lies outside his own speciality. It may indeed be to the advantage of his boys that they should be taught the subjects in which they never intend to specialise by one who knows these subjects as his boys ought to know them, widely rather than deeply.

It is a mistake to suppose that the future historian will best obtain such a knowledge of mathematics as will take its proper subordinate place in his single wide interest by studying under the most distinguished mathematicians. These experts may well have lost all the interest they ever had in such 'practical mathematics' as the literary boy is likely to need. That is no reason why the mature historian should not endeavour to understand something of the problems that are exercising first-rate minds engaged in mathematical research. But it is a reason why a fifth-form boy whose main interest is in history should learn mathematics from a teacher who is qualified by his sympathy with the boy's interests rather than by his distinction as a mathematician. It is unfortunate that many modern secondary schools ignore this principle.

In the second case, where the members of his form are going to leave school early, so that most of their work should be of the wide sort, the form-master who knows them and who has perhaps had personal experience of an industry or other occupation which most of them intend to

¹ See first footnote on p. 302. Cf. Whitehead: 'Always there must be a dominant emphasis' (*The Aims of Education and Other Essays*, 1929, p. 74, quoted on p. 413 of the *Spens Report*).

enter,¹ will be better able than a more academic specialist to excite their interest and extend it from their future callings to their immediate work in school.²

§ 5. RELIGION

The most convincing reason why form-masters and form-mistresses should not be supplanted, but only supplemented, by specialist teachers is that the religious side of education is vitally important.³ And, in the words of a famous headmaster,

Once the Scripture teaching is in the hands of one person who visits form after form for that purpose only, the boys begin to smell a rat, and to think that the Reverend A is set to teach them what their form-masters B, C and D know too much to believe.⁴ It cuts at the root of the old form-master

¹ It may be engineering in the case of a Technical High School or the technical forms in a multilateral Grammar School; or it may be agriculture in the case of a rural Grammar School.

² Cf. *Spens Report*: 'Work which the pupil himself recognises as possessing value for the next stage of his life... serves to hold and to stimulate his interest, and is likely to react favourably on all his work' (p. xxv). Indeed, the experience of the earliest Junior Technical Schools showed (as was noted by the present writer in a paper printed in 1907) that lessons on manufacturing processes and workshop practice to boys about to enter engineering works so improved their English composition that 'some of the essays were on a totally different plane from those usually met with at this age'. At the same time, the interest in the Navy of the cadets at Osborne was used to awaken and keep alive their interest in every lesson whatever its subject.

³ See below, p. 314.

⁴ Cf. the *Spens Report*: 'Just because the content of that teaching touches life at more points than that of any other subject and is so closely related to individual thought and conduct, we hold that Form Masters and Form Mistresses provided they desire to do so should take part in a kind of instruction that may mean so much to their pupils' (p. 210). 'Scripture, like any other subject, is commonly at a disadvantage when it is not taught by someone who is a regular member of the staff and therefore in a position to relate it to the work of the school as a whole' (p. 212).

system, which is one of the best of the methods handed down from the old schools: the form-master, if anyone, ought to know the boys well, and he can best teach them the Bible well. I hold very strongly to the opinion, that Scripture and all English subjects can most properly be taught by the form-master, and that if he is adequately prepared to teach History and English, he can with no great trouble make himself adequately prepared to teach the Scriptures.¹

Now we have examined in an earlier section of this chapter the reasons why any particular branch of knowledge should be studied by this boy or that girl. Among the studies proper for John or Mary, all have not the same function. All must, indeed, take their places in the single wide interest that he or she is building up; all must therefore hang together; and each should add something to the intellectual discipline of all. But some of John's studies will contribute more than others to the centre of his interest,² to his religion and philosophy of life,³ to that harmony of purpose⁴ on which we have laid so much stress, to his share in the national tradition and the unity of civilisation.⁵ Some other studies will supply more of the material for his 'work-system'⁶ and help to fit him for the special life in which he will best serve his fellows and realise his own best self. Others again will play

¹ *The English Tradition of Education* (1929), p. 42, by Sir Cyril Norwood, President of St John's College, Oxford, and former Headmaster of Harrow and Master of Marlborough. The Headmaster of Harrow could choose his assistant masters with this function of form-masters in his mind. He did not therefore need to add the footnote on p. 210 of the *Spens Report*: 'Much as we desire to see the importance of Scripture teaching enhanced, we regard it as essential that liberty of conscience should be preserved for teachers as well as for parents of pupils.'

² See above, pp. 228 *et seq.*

³ See above, p. 279.

⁴ See above, pp. 231, 233 and 236.

⁵ See above, p. 287, and section 6 of this chapter.

⁶ See above, pp. 224 *et seq.*

their part in widening, rather than deepening, his interest,¹ helping to make him a better citizen by adding to his harmony of purpose and his feeling of comradeship with his neighbours some understanding of their special interests in people or things.

Since we have summed up our account of the aim of education in the four words 'To form Christian characters',² the paramount importance of religion in the life of every school³ follows at once. Religion, as we said, is personal and experimental. It is not merely, or chiefly, concerned with knowing certain facts, although, as St Peter insisted, we ought to be 'ready always to give... a reason concerning the hope that is in' us.⁴ The Christian qualities noted in Chapter 15 are to be cultivated, in the main, outside the class-room.⁵ But their seeds may sometimes be sown in a Scripture lesson, or in the course of any other study, if the teacher himself possesses a single wide interest and seizes his opportunities while he is teaching a *subject* also to teach his *pupils* to see all knowledge as a single whole.

While, therefore, Scripture should be studied by every boy and girl,⁶ what matters even more is that every subject

¹ These studies introduce some order into the comparatively unorganised fringe of a single wide interest. See above, pp. 193, 233, and § 3 of the present chapter.

² See p. 296 above.

³ 'Religion lies at the base of all education... It underlies the whole of life and is the inspiration of the whole life's effort' (Norwood, *loc. cit.* p. 51).

⁴ I Peter iii, 15.

⁵ See below, p. 318.

⁶ Cf. the *Spens Report*: 'We believe that there is a wide and genuine recognition of the value and importance of religious instruction and the teaching of Scripture in schools' (p. 206). 'No boy or girl can be counted as properly educated unless he or she has been made aware of the fact of the existence of a religious interpretation of life' (p. 208). 'Christianity has played the most important part in the development of our civilisation,

should contribute to the architectural consistency and completeness¹ of the curriculum and be taught, not merely as a separate section of the realm of facts,² but as an integral part of the knowledge of God.³ To foster the growth of true religion is indeed the main function of every secondary school.⁴ Its chief concern is to foster the development of the most central and most valuable region of every pupil's single wide interest, with all its sentiments and loyalties, and, above all, its master-purpose. The means to that end include, but are not confined to, the study of Scripture.

§ 6. WORLD LOYALTY

'Religion', wrote Professor Whitehead, 'is world loyalty'.⁵ We are not going to discuss how to apply the principles of this book to every subject studied in school. The *Spens*

and...without a study of the meaning of the Bible any adequate knowledge of what that civilisation means is impossible' (p. 170).

¹ The phrase is used by Sir Percy Nunn in *The New Teaching*, p. 173. Cardinal Newman wrote of the knowledge to be sought in education that 'philosophy must be its form, or, in other words, that its matter must not be admitted into a mind as so much acquirement, but must be mastered and appropriated as a system consisting of parts related to one another in the unity of the whole' (*Idea of a University*, Discourse 6, 1832).

² See above, pp. 200 *et seq.*

³ See above, p. 233.

⁴ Some years ago the present writer made this statement when discussing with a group of a dozen or more of the leading engineers in Manchester how the future leaders of the industry might best be educated. One after another of the members of the group took up the question and asserted that, in his opinion, religion was intimately connected with all that was best in his own business. One of them went so far as to say that he never made any advance in his designs or methods of manufacture without feeling its close relation to his religious life; and it appeared that most, if not all, of those present shared the same experience. Cf. the experience of the architect of Canterbury Cathedral in Dorothy Sayers' play *The Zeal of Thine House*.

⁵ *Religion in the Making* (Camb. Univ. Press, 1927), p. 49.

Report has, in effect, done that for us; and we can accept most of its conclusions in this field. But about 'world loyalty', human brotherhood, or the world community, the *Report* has little to say. Perhaps it is because these things seemed so far off, so remote from practical politics, when the *Report* was signed in October 1938, that their proper place in other studies besides Scripture is almost ignored. But the *Teachers' Declaration* recognises, and gives reasons for holding, that 'world affairs', or the study of international relations, deserves a place in the curriculum, although not on the time-table, of every school.¹

The teachers' associations which declared this opinion in

¹ In the memorandum, described on p. 300 above, the teaching profession declare their belief 'that instruction in the aims and work of the League of Nations may be so given as to serve some of the chief purposes of education. Thus it may increase the architectural consistency of the curriculum.... This knowledge is also practically useful because the future of international relations closely concerns every boy and girl in the modern world [see also above, p. 287].... Moreover, this new knowledge, properly taught, provides a strenuous intellectual discipline.... Judged by these tests, knowledge about the modern world in its political aspect... qualifies for a place in the curriculum. We do not, however, recommend a separate place in the time-table for it. We prefer to see it taught in connection with existing studies in schools of all types.'

How that may be done is illustrated in the *Spens Report*: 'One important aim of the English teaching will be to give the pupils some idea of the meaning of civilisation and of their own country's contribution to it; some recognition, in fact, of the heritage into which they enter and the responsibilities awaiting them as citizens. But other countries have contributed as much or more to the building up of western civilisation, and some knowledge of the differing contributions and attitudes to life is needed for a sympathetic understanding of them' (p. 175). Or again: 'Our pupils should discover, as occasion offers, how much our national development owes, in many of its aspects, to the influences of other peoples, should learn to respect great civilisations which are widely different from our own, and should understand how essential international co-operation has become to the progress of science and invention and the applications of knowledge and skill in increasing the health, wealth and convenience of mankind' (p. 153).

1927, and the three associations of local education authorities¹ which shortly afterwards endorsed the *Teachers' Declaration*, in its main lines, have, for many years, been represented on the Education Committee of the League of Nations Union. That Committee has done a great deal to promote the serious study of international relations in the schools of this country. Its publications,² conferences for teachers, summer schools and camps, educational visits abroad, and school societies³ have been much used by teachers, governing bodies and local education authorities.

Work of this kind owes its outstanding importance to the fact that the creation, whether by quiet growth or by sudden metamorphosis, of a World Commonwealth that will bring peace to mankind can never be achieved until the world's great democracies have been educated to understand the need for it and to feel for their common world a sentiment of loyalty and devotion even greater than their national patriotisms.

But world loyalty, as Whitehead's words⁴ remind us, is impossible without religion. We recall how Pericles saw the need for a religious motive if his dream of 'a united Greece with Athens as its eye' were ever to come true.⁵ So also the World Commonwealth, the grown-up League of Nations, must be, not merely a profitable business enterprise (to multiply prosperity) or a reliable insurance company

¹ The County Councils' Association, the Association of Municipal Corporations, and the Association of Education Committees.

² Such as *Teachers and World Peace*; *Geography Teaching in relation to World Citizenship* (1933); *Modern Language Teaching in relation to World Citizenship* (1935); Maps; leaflets; etc.

³ In 1937 two secondary schools out of every five in England and Wales possessed Junior Branches of the League of Nations Union.

⁴ See above, p. 315.

⁵ See above, p. 279.

(to pool security), but the expression of a great ideal and the embodiment of some of the deepest longings by men of all nations who have dreamt dreams and seen visions of the Commonwealth of God on earth.

§ 7. THE SCHOOL AS A SOCIETY

A school that is to sow the seeds of world loyalty should itself be the object of its pupils' devotion. They must feel not only that they belong to it but that it, in some sense, belongs to them. They must take pride in its triumphs and be hurt by its failures. So will their sentiment of loyalty to their school become part of their own self-regarding sentiments. When the objects of these sentiments have been thus widened, they can be further extended so as also to include the greater communities to which English boys and girls also belong: England, the United Kingdom, the British Commonwealth, and the World.

A school, or college, or university has indeed other functions to fulfil besides being a 'place of learning'. It is also a social unit or society.¹ Its contribution to the growth of character depends on much else beyond formal teaching or private study. On many, perhaps on most, pupils or undergraduates a more lasting effect is produced by influences of the kind associated at Oxford and Cambridge with residence and tutorial superintendence. These influences belong rather to the playing fields and the river; the school or college societies; the school or college chapel; the boarding houses, hostels or rooms in college or out; the buildings, *campus* or neighbourhood of the school or college or university. These influences combine to make the 'atmosphere'. It belongs

¹ Cf. *Spens Report*, pp. 147 and 197.

to the society as a whole, not to any one side or section of it. It often leads to a characteristic point of view, and sometimes to distinctive mannerisms or even a distinctive manner. And it may remain much the same from one generation to another, while the curriculum alters almost out of recognition.

This aspect of university work has never been better put than by Cardinal Newman in 1852:

I protest to you, Gentlemen, that if I had to choose between a so-called University, which dispensed with residence and tutorial superintendence, and gave its degrees to any person who passed an examination in a wide range of subjects, and a University which had no professors or examinations at all, but merely brought a number of young men together for three or four years, and then sent them away, as the University of Oxford is said to have done some sixty years since, if I were asked which of these two methods was the better discipline of the intellect, . . . which of the two courses was the more successful in training, moulding, enlarging the mind, which sent out men the more fitted for their secular duties, which produced better public men, men of the world, men whose names would descend to posterity, I have no hesitation in giving the preference to that University which did nothing, over that which exacted of its members an acquaintance with every science under the sun.¹

The importance of 'atmosphere' is due to its direct appeal to the affects—the emotions and conations—of all members of the society. It may thus help to build single wide interests that are all the deeper because of these strong feelings. So strong indeed is the emotional interest which many famous schools and colleges arouse in their members that it may play a very great part in their education. For example, the master who

¹ Quoted in the *Final Report of the Royal Commission on University Education* in London, pp. 26, 27.

will have the best chance of forming single wide interests in fourteen-year-old school boys is one who possesses his full share of the spirit of the school, a deep understanding of its aims, a profound sympathy with its ideals, and enough athletic prowess to add distinction to the school in the eyes of its younger pupils.

The appeal made by the 'atmosphere' of a school may be enhanced by a historic past. To belong to a school founded by John Colet, indebted to Erasmus for its daily prayers, and counting Milton and Marlborough among its pupils deeply impresses every Pauline. A Trinity man, especially perhaps a Trinity physicist, cannot help being stirred by the thought of belonging to a college that produced Francis Bacon, Isaac Newton, Clerk Maxwell, Ernest Rutherford and J. J. Thomson. And venerable buildings—chapels, halls, great courts and dreaming spires¹—deepen the emotional appeal of the memories of famous men.

The past lives on in the present. It may sometimes hamper progress. Sometimes, however, a school or college society succeeds in preserving ideals of heroic conduct, high thinking, patriotism, and search after truth, when, all around, moral and intellectual standards are temporarily depressed. 'Continuity, tradition, and the trustee-sense which you find in an Oxford College or an Inn of Court—the sense that you hold for those who come after you what was held for you by those who went before',² these it is, and the ideals of public service linked with them, that tend to become impressed upon every member of a school or college where they flourish.

¹ Mr Compton Mackenzie's title for the Oxford section of his novel *Sinister Street*.

² *Midas and Son*, by Stephen McKenna, pp. 220, 221.

A man can hardly spend long years in the company of people who share a common purpose without himself coming to share it also.

It is true that a historic past, a long tradition and ancient buildings lie beyond the reach of schools and colleges of recent foundation. Yet they also can seek to produce great men and, in many cases, have already done so. They also, as they extend their buildings, can build beautifully; and that means, in the first place, simply and serviceably. They also can supply training in self-government. They can render social service to the members of the school and (through school and college missions, summer camps, and the like) to the outside world as well. They can foster loyalty to a small society and sow the seeds of higher loyalties that will flourish later in life. And a school that is divided, as every school may be,¹ into houses, or a university that is made up of colleges, is also a microcosm of a world of nations where lesser loyalties to the parts support but never rival a larger loyalty to the whole.

There is one other service of inestimable value that a school or college or university may render to the community. It brings together a number of young people from different homes, and, in the case of many boarding schools and universities, from different parts of the United Kingdom and from the British Commonwealth overseas. In the past, England has owed much of her unity to her Public Schools and ancient universities: small wonder that Herr Hitler, aiming at unity within his Third Reich, is trying to make German boarding schools on the English model. And now a beginning has been made, by the Rhodes Trust and the English-

¹ Cf. *Spens Report*, p. 204.

Speaking Union, of adding a leaven of Americans into the English Public Schools and to the University of Oxford. At the same time English boys are going, although in small numbers, into the great American boarding schools, while a steadily increasing stream of graduate students crosses the Atlantic in both directions and so helps to bring the English-speaking peoples into a harmony of purpose and of outlook. Nothing could better ensure that government of the people by the people for the people shall not perish from the earth.

§ 8. CONTINUITY

Unless there is continuity all along the line, a single wide interest is not likely to be developed by a system of education that extends from the nursery to the university and includes the further training of those who have begun to practise a craft or a profession. Every stage of education should prepare for the next. A continuous course of study at one school or college after another will not suffice. The successive curricula should shade into each other.¹ The last whole-time school should prepare specifically for the occupation that comes after;² and continuity between them should be enhanced by part-time classes in suitable cases.

¹ In their *Report on Practical Work in Secondary Schools*, 1913, the Consultative Committee of the Board of Education state that manual work in modern infants' schools is suddenly discontinued; and they add that 'this abrupt transition cannot be sound' (p. 6).

² 'The nearer a pupil is to his entrance into life, the more steadily must the actual practical needs of his occupation be kept in view, and the more decided therefore must be the bent of his education to that end' (The Consultative Committee in their *Report on Higher Elementary Schools*, 1906, p. 11). Cf. also the *Spens Report*: 'Especially towards the end of the [secondary school] course, studies may well be introduced to a limited extent which have a definite bearing on the next stage of their life' (p. 152).

The teacher who has practical experience of the next stage of his pupils' education¹ can prepare each of them to link up his new life with his growing single wide interest, so as to widen it further and to deepen it without destroying its unity: the creation of several new and separate interests may thus be avoided. The university lecturer to engineering students, by maintaining close personal touch with works practice, can lead his undergraduates to make the most of the works training that will follow their graduation. The same principle applies to the education of boys or girls who are about to transfer from school to college, or from one school course to another. The Sixth Form master who keeps in close touch with his university, engaging perhaps in original research, and who is qualified to accept a university lectureship,² can make his teaching lead continuously to the honours degree courses on which his boys are about to enter.

Continuity in education has a two-fold aspect. It looks to the past as well as to the future.³ Educators should take into account what their pupils have lately been doing as well as what they are about to do. For example, the works training

¹ Cf. above, pp. 311-12.

² For example, Mr Frank Carter, after taking a first class in Classical Moderations and in *Literae Humaniores*, and after a year's experience at King's School, Ely, was appointed to St Paul's by F. W. Walker in 1884. He remained at St Paul's until 1896, when he became *Professor of Greek at McGill*, afterwards returning to the staff at Winchester. While at St Paul's 'his duties were to share with another master—until 1894 Mr Christopher Cookson, who in that year was recalled to Oxford as a *Fellow and Tutor of Magdalen*, and afterwards with Mr E. C. Marchant', who became a Fellow and Lecturer at Peterhouse and is 'now a *Fellow of Lincoln*'. (See *The Times* of 12 January 1939: italics mine.)

³ 'In the secondary school the pupil's studies must be retrospective in so far as they are based on what has gone before, and prospective in so far as they should look forward to maturer studies or to his occupation on leaving school' (*Spens Report*, p. 149).

that follows an undergraduate course in engineering is most effective when it is directed by an Apprentice Master who keeps in close touch with the universities from which his 'college apprentices' have come. And, in general, the more a teacher knows of the interests of his pupils when they reach him, and the more he does to widen and link up these interests, the better chance will he have of developing a single wide interest in each boy or girl.

§ 9. SELECTION

We have seen that the single wide interests of different boys and girls should not be all alike. The children differ in their innate qualities; they have different work to do in the world; and they ought to be selected according to their several natures to receive—in so far as may be necessary, at the public expense¹—whatever education will best fit each of them to serve God and man as best he can and to realise his best self in that service.²

That does not mean that children should be educated specifically for future occupations chosen without regard to their personal qualities or inclinations. Such a policy would meet with certain disaster; but it could hardly be more waste-

¹ Cf the *Spens Report*: 'Pupils should not secure admission to the schools in question'—secondary schools aided or maintained by local education authorities—'merely because of the greater wealth of their parents, . . . admission should be determined only by the extent to which each individual is likely to profit by the course of instruction provided, and . . . where educational awards are made by public bodies, the amount of any assistance given should vary according to the circumstances of the parents. In consequence . . . we are of opinion that the 100 per cent special place system ought in general to be adopted' (p. 326). 'On 31 March 1937 there were 77.0 per cent ex-public elementary school children [in grant-aided secondary schools], 46.0 per cent free, and 7.4 per cent partially free' (p. 95).

² See above, pp. 296, 297.

ful than giving the same education to all comers, however much or little they were going to have of it, and whatever use they hoped to make of it. 'The idea', wrote Ruskin, 'of a general education that is to fit everybody to be Emperor of Russia... is the most entirely and directly diabolical of all the countless stupidities into which the British nation has of late been betrayed.'¹

But it is perfectly possible to pick out, a year or two before the end of each stage of education, those pupils whose qualities of character and intellect² justify their education being continued a step further. The studies of the selected children will then remain of the deeper sort, while the work of the others will widen out in preparation for the new

¹ *Fors Clavigera*, p. 354. Cf. also the criticism in the *Spens Report* of the Regulations for Secondary Schools issued by the Board of Education in 1904: 'In the philosophy underlying these Regulations "the general progressive complete course" is considered without relation to the child' (p. 71). 'Furthermore, the concept of a general education which underlies these Regulations was divorced from the idea of technical or quasi-technical education, though in reality much of the education described as "liberal" or "general" was itself vocational education for the "liberal" professions... An unreal and unnecessary division was introduced between secondary and technical education' (p. 67). 'The term "general education"... can hardly convey any clearly defined meaning so long as the problem of education in Secondary Schools is approached from the point of view of the subjects to be studied rather than from that of the development of the pupil as an individual' (p. 70).

² For example, *w* as well as *g*, *v*, *K* and the rest: see above, Chapter 7. The *Spens Report* recommends that, while the most able children should have an absolute right to secondary education, in so far as may be necessary at the public expense, i.e. to a 'Special Place although not an absolute right to a Special Place in any particular school' (p. 327), and while the least able should be excluded from grant-aided secondary schools, the 'choice for grammar school places as between pupils who fall into neither of these classes should be made on the result of a method of selection, including an interview, in which facts'—such as the character and purpose of the pupil and his parents' plans for him—'other than their relative place in an order determined by the examination are brought into account' (p. 332).

experiences awaiting them when they leave school and go out into life.

As the development of the abler pupils gradually discloses their special aptitudes and inclinations, their deeper studies should be suited to their different needs. As they grow older¹ their secondary schools ought therefore to offer them an increasing variety of deeper courses, if we may so describe the curricula of which the deeper studies form the core. These deeper studies prepare, as we have seen, for more advanced work that is to follow; but the courses built around them also include wider studies of subjects that are not going to be taken further. Of such courses, one or two² should suffice for pupils between the ages of 11-plus and 13-plus; and three³ between 13-plus and 15-plus. But the ablest

¹ When an able boy is selected to enter a secondary school shortly before the age of twelve, he need not immediately make up his mind whether he wants to be a judge or a professor or a general, although it is not long since he had to decide at that early age if he wanted to become an admiral. The educational avenues to all these careers, and to many humbler ones, do not begin to fork until a much later age. Indeed, boys who are to enter different professions at twenty-two may need the same education at seventeen, while there ought to be a great difference between the studies of two seventeen-year-olds who are both going to be engineers, one entering the works at eighteen and the other at twenty-two.

² Two, if the future classical scholar is to be allowed to begin Latin and perhaps Greek also before this stage of 'junior secondary' education is over. The ages mentioned here and in the following pages are those of most boys or girls at the time indicated; or, technically, the 'mode' of their age distribution at that time.

³ Centred respectively in Classics and Ancient History; in English and Modern Languages; and in Mathematics and Natural Science. This stage may be called that of 'intermediate secondary' education. 'It is important that in the last year, possibly in the last two years, before the School Certificate is taken, such pupils' as 'go ultimately to a University', 'should have had instruction in the subject or subjects in which they will later specialise, of such a character as to lay the necessary foundations for their Sixth Form work' (*Spens Report*, p. xxiii).

pupils, who intend to go on to a university, will be at a grave disadvantage¹ unless the Sixth Forms of their schools can prepare them for open scholarships in any one of four or five branches of study: Classics, Mathematics, Natural Science, History or Modern Languages. Along that road lies the goal indicated by Comenius three hundred years ago: *that there must eventually be equality of educational opportunity where there is equality of capacity to profit by it.*

Meanwhile, those who were picked out in their twelfth year for transfer to a Grammar School or a Technical High School,² but who were not selected again two years later for one of the deeper courses in their own or some other secondary school,³ should pursue wider courses of study.

¹ In 1933-34, out of 558 open scholarships (including exhibitions) awarded by Oxford and Cambridge colleges to schoolboy candidates, 274, or 49.10 per cent, were won by boys from Public Schools (where over 50 per cent of the pupils are boarders or, where this is not the case, in which the tuition fees are over ten guineas a term) and only 58, or 10.39 per cent, by boys from 'Grammar Schools', although there were twice as many boys attending the Grammar Schools as in the Public Schools. (Hogben, *Political Arithmetic*, pp. 423, 425, 431.)

² We here use the name proposed in the *Spens Report* to describe the schools generically called 'Junior Technical Schools' by the present writer in 1907 when only thirteen schools of this type, including two or three already known by that name, were recognised for grant under § 42 of the Board of Education's Regulations for Technical Schools. The education provided by these schools was described as 'secondary' in a series of Recommendations on *A National System of Education* issued by the Federal Council of Lancashire and Cheshire Teachers' Associations and published by the Manchester University Press in 1920: see Recommendation 4 reprinted on p. 338 below. Cf. the quotation in italics from the *Spens Report* in the footnote on p. 325 above.

³ Able pupils who at 13-plus seem likely to deserve a university education, and whose parents want them to stay on at school until eighteen with that aim in view, should be transferred at 13-plus and not at 15-plus from a school that cannot do sixth-form work in several different kinds to one that can. The reasons are discussed below on pp. 334-6.

These wider courses should, as we have already seen,¹ be centred in a vocational or quasi-vocational interest and extend it to all the work in whatever subject. The value of this 'senior secondary' education² does not depend upon its being followed by further formal study of the same subjects. In that sense 'senior secondary' education, unlike the deeper courses that constitute 'intermediate secondary' education for pupils of the same age, is complete in itself.³

The *Spens Report* suggests⁴ that the intermediate secondary education required by Grammar School pupils who will eventually go on to the university may consist of senior secondary courses modified by the deeper study of the future special subject. But the modification may have to be greater than the Report contemplates because of the different interests and purposes of the pupils for whom the two types of education ought to be designed. Even the Report's brilliant essay on mathematical teaching⁵ augurs a danger lest the merits of 'Mathematics for the Million' may result in ignoring the special needs of future mathematicians.⁶

We have maintained that it is feasible to pick out the pupils best qualified by nature and inclination to profit by longer, higher and more costly education. It is hardly necessary to argue further that a policy of selection, being practicable, is also wise. Yet this policy does involve the gradual raising of standards for admission to the higher schools and univer-

¹ See p. 312, especially the second footnote.

² We give the name of 'senior secondary' education to the wider courses followed, during their last two years at school, by pupils who intend to enter whole-time employment at or soon after the age of sixteen. The deeper courses for boys of the same age were described as 'intermediate secondary' education in footnote 3 on p. 326.

³ Cf. the *Spens Report*, p. xxiii.

⁵ At pp. 235-42.

⁴ On p. xxiii.

⁶ See above, p. 305.

sities, if only to avoid training at the public expense more people than the community needs for each occupation. Against this raising of standards there is sometimes an outcry in this country, as there generally is in the United States. It is therefore well to remind ourselves that the public interest must suffer from the rival policy of throwing every kind of education open to all those who prefer the calm of academic groves to the feverish struggle of the world outside.

If, for example, the medical schools opened their doors to all who cared to enter at the public expense and without any competitive examination, the crowd of incompetents would prevent the better type of student from acquiring the knowledge and experience needed to make him into an efficient practitioner. Grave harm would thus be done to medical services.

The number of people who should be selected, re-selected and selected again to receive, so far as may be necessary at the public expense, the kind of education that will best prepare them for a particular kind of service—for discovery and research, for teaching, for governing, for producing or distributing material goods, or for ministering in some other way to the health and happiness of mankind—is the number which, when added to the number of those whom private education has prepared as well or better for the same service, will supply the demand, or so much of it as is also a need. Of course the private provision of education, including the great privately endowed institutions which in England are known as Public Schools, cater especially for persons who hope to undertake the most influential, interesting and remunerative forms of service. But privately educated men and women ought only to attain those positions for which they are better

qualified than the best that the community has been able to select and educate for service of the same kind. The public provision of education should indeed utilise all the really efficient¹ private schools. But it should ensure that able boys, whose education their parents cannot afford to pay for, are at least as well prepared to become statesmen, ambassadors, diplomats, bishops, bankers, captains of industry or other leaders in Church or State as any sons of families possessing wealth or social position.

Healthy competition between a public system of education and efficient private schools and colleges will foster experiments and make for progress in the public as well as in the private institutions and so benefit the community. But the private schools should be open to public inspection in order to ensure that they do not waste the human material entrusted to them.² On this condition, every child (or his parents on his behalf) should be free to decide whether he will be educated in institutions chosen or approved for him by a public authority and so far as need be at the expense of the community, or else privately, at no cost to public funds.

No more need be said in defence of the principle of selection. Whoever recognises that mentally defective children should be picked out for special treatment must acknowledge that selection is right in principle for every grade of subnormality or supernormality. It is especially important that parents and their children should regard it as a public duty to co-operate in the selection of the ablest young people to receive the highest education.

¹ Cf. the recommendation of the Bryce Commission on Secondary Education, 1895, quoted on p. 61 of the *Spens Report*.

² Cf. the *Spens Report*: 'We think it important that compulsory inspection of private schools should be introduced' (p. 332).

§ 10. PROSPECTS

How the process of selection might be worked according to the principles of this book, from the public elementary or private preparatory school to the university, and on to different kinds of employment, was shown in a plan drawn twenty years ago and first published in 1920 with recommendations by the Federal Council of Lancashire and Cheshire Teachers' Associations for establishing *A National System of Education* in England.¹ That plan set forth the changes recommended to be made in the linked system of schools and colleges through which the main stream of English youth should be flowing ten years later. It distinguished, as we did in Section 9 of this chapter, between types of education and types of school. It showed the same school giving different types of education to different groups of pupils of the same age,² and the same type of education being provided in schools of different types.³

First in the *Hadow Report* and then in the *Spens Report* the Consultative Committee of the Board of Education have suggested most of the same changes. In order to see how far this plan of twenty years ago has met with the Committee's approval or, at least, resembles their own plan, let us trace the outline of the national system of education as it would exist in England if the principal changes proposed in the *Spens Report* were made. We shall notice a few places where

¹ The same plan was included in *Education and World Citizenship* by the present writer (Camb. Univ. Press, 1921). See above, p. 299.

² E.g. 'senior secondary' (wide) and 'intermediate secondary' (deep) to boys between 14 and 16 in Grammar Schools.

³ E.g. 'junior secondary' (deep) in Technical High Schools (Junior Technical Schools), Grammar Schools, and Private Preparatory Schools to pupils between 11-plus and 13-plus.

the Hadow and the Spens Reports have gone beyond the Lancashire and Cheshire plan and other places where they fall short of it.

Some 90 per cent of all English children in their eleventh year attend public elementary schools.¹ The *Spens Report* describes this 90 per cent as the 'secondary school age-group'.² Of this group, 12·8³ per cent went on from the public elementary schools to grant-earning secondary schools (Grammar Schools) in 1936-7. The *Spens Report* recommends that 15 per cent be accepted for the present as a standard for boys, with a somewhat higher provision for girls.⁴ The Lancashire and Cheshire plan showed 19 per cent for boys and for girls, or 15 per cent of all children of that age. That plan also showed a further 19 per cent of the secondary school age-group proceeding to other secondary schools, called Junior Technical Schools in the plan but Technical High Schools in the *Spens Report*. The Consultative Committee do not attempt to make an exact estimate of the number for whom the Technical High Schools should provide places. But their Report says: '*We are . . . strongly of the opinion that there is room for a considerable development of Technical High Schools.*'⁵ The same opinion was expressed in the Lancashire and Cheshire Recommendations.⁶

All those children of the secondary school age-group who are not selected for promotion to Grammar Schools or

¹ In the year 1934 the figure was 90·75 (*The Silent Social Revolution*, by G. A. N. Lowndes, O. U. Press, 1937).

² *Loc. cit.* p. 320.

³ This was the average figure for England as a whole. It varied in different parts of the country from 4·2 per cent to 26·4 per cent. In Wales it varied from 17·7 per cent to 55·0 per cent (*Spens Report*, pp. 320, 321).

⁴ *Loc. cit.* pp. 322, 323.

⁵ *Spens Report*, p. 323.

⁶ See below, p. 339.

Technical High Schools should nevertheless receive a new type of education from the age of 11-plus. That was the recommendation of the Lancashire and Cheshire plan. It has since been endorsed by the *Hadow* and *Spens Reports*. The plan of twenty years ago described this type of education as 'senior elementary'. But the *Spens Report*, less apprehensive perhaps of financial obstacles, boldly advocates that the 'Modern Schools' giving this type of education should be recognised as 'secondary'.¹

The children transferred at the age of 11-plus from primary schools to Grammar Schools or Technical High Schools should remain there until the age of 16.² The education given to these children from 12 to 14³ should be of the deeper sort: 'junior secondary' education. During their last two years, ending at 16 or 16-plus, the education given to all the pupils of the Technical High Schools and to most of those in the Grammar Schools should be of the wider sort, called 'senior secondary' on p. 328 above. But a small proportion⁴ who will stay on at Grammar Schools after 16, or receive further whole-time education elsewhere, should, from 14 to 16, follow the deeper courses of study that constitute 'intermediate secondary' education⁵ and that

¹ *Loc. cit.* p. 315. The Report describes as 'secondary' both 'selective' Modern Schools (Central Elementary Schools) and 'non-selective' Modern Schools (reorganised Senior Elementary Schools).

² The Lancashire and Cheshire plan showed the leaving age from those schools as 16, with four-year courses from the age of 12. The *Spens Report* recommends five-year courses from 11-plus to 16-plus.

³ In the Lancashire and Cheshire plan; but from 11-plus to 14-plus in the *Spens* scheme.

⁴ The Lancashire and Cheshire plan said about one-quarter of all the pupils in lower Secondary Schools (Grammar Schools), including boys and girls who did not come up from primary schools.

⁵ See above, p. 328; and the third footnote on p. 326.

prepare for more advanced secondary education or for technical studies.¹

So far the resemblance between the Lancashire and Cheshire plan and that of the *Spens Report* is remarkably close. But the Report is loath to follow the earlier plan in drawing a clear distinction between Grammar Schools with a normal leaving age of about sixteen and those which keep practically all their pupils for two more years.² Yet we have seen, on p. 327, that equality of educational opportunity for children of equal ability is out of the question so long as children whose parents cannot afford to send them to Public Schools may have no better chance of preparing for an open scholarship at Oxford or Cambridge than is provided by the average Grammar School. While the annual cost of secondary education in such a school is less than £29³ per pupil, the cost of educating boys at St Paul's School exceeds £70 a year. Although brilliant teachers adorn the staffs of many small Grammar Schools up and down the country, such schools cannot as a rule command the services of many men of the calibre of the St Paul's masters described on p. 323 above. A clever boy in an average Grammar School will therefore have but a poor chance, compared with a Pauline of the same ability, to win a university scholarship in whichever of four or five branches of knowledge he happens to prefer.⁴

¹ Including vocational sixth-form work, as proposed in the Lancashire and Cheshire plan and at pp. 166 and 335 of the *Spens Report*.

² 'We would regard it as a grave disaster if anything were done which resulted in a sharp differentiation of the schools concerned into two classes' (*Spens Report*, p. 330). But it is surely a mistake to sacrifice the ablest boys and girls in the average Grammar School to the demand for better prefects or monitors or athletic leaders.

³ The gross cost per pupil in secondary schools on the grant list in 1936-7 was £28. 16s. Most of it comes from public funds.

⁴ See above, p. 327, especially the first footnote.

Eventually the *Spens Report* is forced to the conclusion that 'circumstances very often arise in which pupils preparing for the University, or for the Higher School Certificate, should not be retained in a small Grammar School, because they cannot be provided in that school with teaching in their best subject. In such cases we consider that transfer is important.'¹

The *Spens Report* is in agreement with the Lancashire and Cheshire plan in preferring that 'cases of transfer at a late age...should not arise'.² The alternatives offered by the new Report are 'a mutual transfer of pupils among large town schools, and occasionally even among schools in a County area, so that strong Sixth Forms may exist in each school for particular types of Higher School Certificate work';³ and admission 'at the age of 11 to the larger school, instead of to their local Grammar School',⁴ of highly qualified children whose parents mean them to stay at school until 18.

The old plan offers a different way out of the difficulty. It does not propose 'the "beheading" of small Grammar Schools'⁵ by taking away the ablest pupils (except for a few who develop late⁶) at about the age of 16; and it recognises that it is impossible at the age of 11 to pick out with any certainty the pupils who will stay, and deserve to stay, beyond 16.⁷ But it recommends, as does the *Spens Report*, that each

¹ *Loc. cit.* p. 336. The Report adds: 'In some county areas a precedent already exists for recognising certain large schools as affording special facilities for highly qualified pupils whose parents express the desire that their children should remain until 18 years of age, with a view to obtaining the Higher School Certificate and perhaps to competing for a University Scholarship.'

² *Spens Report*, p. 336.

³ *Loc. cit.* p. 337.

⁴ *Loc. cit.* p. 336.

⁵ 'A counsel of despair', according to the *Spens Report* (p. 334).

⁶ See below, p. 340.

⁷ Cf. the *Spens Report*, p. 167.

Grammar School 'should make a careful review of its pupils' at the age of 13-plus 'in the light of what has been observed of their progress, development and tastes during the two preceding years, and that the opportunities for transfer to schools better adapted to their abilities or interests should be freely used'.¹ The Lancashire and Cheshire plan, however, insists, while the *Spens Report* denies, that these transfers should include the promotion of the ablest children who, with their parents' consent, look forward to a university education from the smaller Grammar Schools² to *Higher Secondary Schools*.

These schools would compare with the best in the land. They would cost double, or more than double, the average cost per head of the Grammar Schools. But they need not begin below the age of 13. Practically all their pupils would remain to 18; and a promise by parents that their children would not leave before that age, as well as the conspicuous ability of the children themselves, would be a condition of their admission to a school of this type. A subsidiary stream of late-developing pupils would have to be admitted two or three years later. The smaller this inflow of sixth-form boys, the less harm it would do to the spirit of their new school. The same boys, admitted at 13, would have had time, before reaching positions of responsibility, to become loyal members of the school and to pass on its traditions to their juniors.

University studies lie beyond the scope of the *Spens Report*. So also do many other branches of education—technical and part-time education, for example—to which the principles

¹ *Spens Report*, p. 182. The Report recommends that these transfers should take place from Modern Schools to Grammar Schools and Technical High Schools, from Technical High Schools to Grammar Schools, and from Grammar Schools to Technical High Schools.

² Or, we may now add, the Technical High Schools.

of this book are no less applicable than to the problems discussed in the present chapter. These applications have, however, been chosen in order to show how closely they resemble the main conclusions of the *Spens Report*. In that resemblance lies some confirmation of our principles themselves.

But the Lancashire and Cheshire plan of twenty years ago has a wider range than the two famous Reports produced by the Consultative Committee of the Board of Education under Sir Henry Hadow and Sir Will Spens. All but five of the first forty-five Recommendations of the plan¹ are reprinted below, because they sum up so many of the practical results that follow from our inquiry into the relation between Knowledge and Character.

¹ The plan's last thirty Recommendations concern the training of teachers and the teachers' part in administering education. One of these advocates the creation of 'a provisional joint committee for each of some eight or ten provinces into which England and Wales should be divided for [educational] and other administrative purposes'. In the third footnote on p. 332 we had an example of how little equality of educational opportunity there is in England under the existing system, where a pupil's chance of higher education depends on which side of the street he happens to live. The *Hadow Report* suggested 'that ultimately the question should be considered whether' 'legislation... creating new provincial authorities in which the Authorities for Elementary Education only and the Authorities for Higher Education were merged together' 'would not be the finally satisfactory plan' (*The Education of the Adolescent*, p. 181). The *Spens Report* also thought that 'the creation of "new provincial authorities"' 'might ultimately follow', and recommended that the problem 'be remitted to a Departmental or Inter-Departmental Committee' (p. 318). Meanwhile, in January 1939, a step has been taken towards creating provincial authorities for some purposes of national defence. We may add that, for reasons explained in an article in *Nature* so long ago as 3 April 1919, provincial councils are needed for many purposes of local government other than education. But, for education, the need is becoming urgent.

APPENDIX

RECOMMENDATIONS

made by the Federal Council of Lancashire and Cheshire Teachers' Associations in the year 1919 and published in the following year by the Manchester University Press.

EDUCATION BELOW THE AGE OF 12

1. That, by giving the fullest advantages to all children, an end should be made as soon as possible of the existing differences between the preparatory education given to boys and girls under 12 in Preparatory Schools or other Secondary Schools on the one hand, and the elementary education given in Primary Schools on the other.

TRANSFERS AT THE AGE OF 12

2. That transfer from Primary to Secondary Schools should, for the most part, take place at about the age of 11-plus....

3. That, pending the results of further investigations into the nature and uses of mental tests such as are associated with the names of Mr Burt and other experimental psychologists, no better general test than an English paper including an essay and an Arithmetic paper can be suggested for the purpose of selecting children for transfer from Primary to Secondary Schools at the age of 11-plus.

The Council's reason for not recommending that these written tests should universally be supplemented by a *viva-voce* test is that the number of children involved renders universal *viva-voce* examinations impracticable at this stage.

EDUCATION BETWEEN THE AGES OF 12 AND 14

4. That the Junior Technical School¹ of the future should be regarded in all essential respects (including not only the

¹ [Note added in February 1939: As explained on p. 332 above, the 'Junior Technical School' of these Recommendations is the 'Technical High School' of the *Spens Report*.]

type of education given but also the status and remuneration of teachers, the size of buildings and play-grounds, and the like) the equal of a 'Lower' Secondary School; that is, of a Secondary School from which most of the children would depart at 16 years of age. In other words, the Junior Technical School is to be a Lower Secondary School for children intending to enter industrial employment; and therefore the age of transfer to the Junior Technical School should be the same as to the Secondary School, namely 11-plus. Lower Secondary Schools are also described...as 'ordinary' Secondary Schools because the number of children attending schools of this type during the next decade will very largely exceed the number of children attending Higher Secondary Schools.

5. That the junior secondary education provided in the Junior Technical School for children between 12 and 14 should not differ in any essential respect from that provided in Secondary Schools for children of the same age.

In other words, although the junior secondary education provided in Junior Technical Schools may differ from that provided in Secondary Schools with regard to subject matter, it should not differ in type, being transitional [deep] rather than terminal [wide], and more coherent but less comprehensive than the senior elementary education given to children of the same age in Primary Schools.

6. That a clear distinction should be preserved between junior secondary education, the particular aim of which is to prepare for more advanced school studies that follow between 14 and 16, and senior elementary education.¹ In senior elementary education some form of handwork in which the children are readily interested should probably form the connecting link between the various subjects of their curriculum. In certain districts, the practical centre of interest will be related to the group of occupations which

¹ [Note added in February, 1939: Senior elementary education was for children who had missed selection at 11-plus and were expected to end their whole-time education at 14.]

most of the children will probably enter, although senior elementary education is by no means to aim at producing a particular kind of workman.

TRANSFERS AT THE AGE OF 14

7. That there is a need for two types of Secondary Schools, but that such transfers as are necessary from the lower to the higher type of Secondary School should take place at the modal age of 14.

It would be a mistake, except in special cases, to transfer a pupil of 16 years of age from a lower to a higher Secondary School, in which he would then spend only two years.

8. That provision should be made for the transfer of a few exceptional pupils from Junior Technical Schools to other Secondary Schools at the age of 14; and that provision should be made for the transfer of a few exceptional pupils from ordinary Primary Schools to Secondary or Junior Technical Schools at 14.

The words 'a few exceptional pupils' are used here, and throughout this report, to mark a small percentage, generally less than five per cent, of the whole number of persons of a given age, who are receiving a given type of education in a given type of school, and from among whom the transferred candidates are selected.

9. That reciprocal provision should be made for the transfer of a few exceptional pupils from lower Secondary Schools to Junior Technical Schools at the age of 14.

EDUCATION BETWEEN THE AGES OF 14 AND 16

10. That a distinction similar to that described in recommendation 6 as desirable between junior secondary education on the one hand and senior elementary education on the other should obtain between the types of education received by boys and girls between the ages of 14 and 16 in Secondary Schools according as they are proceeding to further whole-

time study after the age of 16 on the one hand, or, on the other, are intending to discontinue whole-time education at that age. For the former a transitional¹ (intermediate secondary) type of education is required, and for the latter a terminal¹ (senior secondary) type, the former being more concentrated or coherent in that at least half the week would be devoted to a group of closely connected studies, while education of the latter type should be more general and more comprehensive and involve less concentration upon any one group of studies. In senior secondary education an attempt should be made to focus attention on the group of subjects relating to the particular occupation or group of occupations which the children are likely to enter on reaching the age of 16. This is a familiar feature of senior secondary education provided in Junior Technical Schools.

11. That in girls' schools it is of special importance to avoid overpressure; and that in these circumstances girls should generally occupy at least one more year than boys over their intermediate or senior secondary education.

Thus the age at which girls should be presented for the first or second School Examination should generally exceed by one year the corresponding age for boys; and the age of transfer of girls from one type of education to another should exceed the corresponding age for boys by at least one year in the case of transfers taking place at ages exceeding 14.

12. That the scope of the School Certificate Examination should be widened—by offering alternative papers and by increasing the number of alternative subjects—so as to form a suitable final test for senior as well as for intermediate secondary education; and that when this widening has been effected it will be desirable to make the School Certificate Examination an entrance test for the wider of the two 16- to 18-year-old courses. (See recommendation No. 15 below.)

¹ [Note added in February 1939: The words 'transitional' and 'terminal' are the equivalent of the words 'deep' and 'wide', as explained on p. 339 above.]

TRANSFERS AT THE AGE OF 16

13. That, while it is essential that arrangements should be made for the transfer of a few exceptional boys from Junior Technical Schools to higher whole-time education at the age of 16, the Junior Technical Schools should keep clearly before them from the outset the aim of preparing boys, not for higher whole-time education, but for employment coupled with part-time education at the age of 16.

EDUCATION BETWEEN THE AGES OF 16 AND 18

14. That Higher Secondary Schools should provide two types of education for boys between 16 and 18 (or girls between 17 and 19), one type (advanced secondary education) being more concentrated or coherent in that pupils receiving it should devote at least half the week to a single group of closely connected studies, while education of the other type (senior technical education) should be more general or comprehensive and involve less concentration upon any special group of studies.

15. That before entering upon advanced secondary education pupils should be required to have obtained the School Certificate, but that while the School Certificate Examination retains its present form, the possession of this Certificate should not be an essential qualification for admission to senior technical courses.

16. That, whenever possible, senior technical courses (*e.g.* in housecraft or secretarial subjects) should be provided for girls who have completed their intermediate secondary education and are remaining for two more years in whole-time attendance at a Higher Secondary School.

17. That girls in Higher Secondary Schools should not, except in special circumstances, be allowed to take up special training for secretarial or other occupations until after satisfactorily completing their intermediate secondary education, and, as a rule, after gaining the School Certificate.

18. That the present provision made in Technical Schools, Schools of Domestic Economy, Schools of Art, and the like, for the whole-time senior technical education of boys between the ages of 16 and 18 (and girls between the ages of 17 and 19) should be greatly increased.

The provision of senior technical education should include two-year whole-time courses in Senior Technical Schools for boys between the ages of 16 and 18 (or girls between 17 and 19) who have completed intermediate secondary courses and obtained the School Certificate.

19. That to these senior technical courses should be admitted a few exceptional persons who have distinguished themselves in their daily work and in their intermediate part-time studies since discontinuing their whole-time education. Such persons would normally enter whole-time senior technical courses at a later age than boys entering direct from Lower Secondary Schools.

20. That, where Senior Technical Schools are not available, provision of senior technical courses should be made in Higher Secondary Schools for boys as well as in those for girls.

21. That intermediate part-time education, intended for persons who are proceeding to more advanced studies later on, should differ from senior part-time studies intended for persons of the same age—16 to 18—who are likely to discontinue formal education on reaching the age of 18, and that this difference should resemble that described in recommendation 10 as desirable between intermediate secondary and senior courses.

Thus what are commonly called citizenship studies, including especially English, should receive more attention in senior than in intermediate part-time classes.

TRANSFERS AT THE AGE OF 18

22. That the normal age for entering the University should be about 18, or in the case of girls, 19.

23. That secondary school examinations do not neces-

sarily provide the best test of the fitness of candidates for University courses.

24. That the entrance test to undergraduate honours courses (see recommendation 27 below) should comprise three parts, namely (a) a general part, of the standing of the School Certificate; (b) a special part, of the standard of the Higher Certificate; and (c) an interview, without which no undergraduate should be admitted to a University.

25. That in order to facilitate co-operation between British Universities at home and overseas, it is desirable that Universities should agree to accept the first or general parts of each other's entrance tests.

26. That the School Certificate Examination, widened so as to form a final test for senior secondary education, should be regarded by English Universities as a sufficient test of general education, it being open to every University to require such standard of special attainment for admission to any Honours School as they may see fit. (See recommendation 12 above.)

EDUCATION BETWEEN THE AGES OF 18 AND 21

27. That honours courses, with their single central subject or group of subjects, rather than pass courses, in which the study of several separate subjects is carried to a uniform level of mediocrity, should in future form the staple of undergraduate studies in English Universities; but that, if pass courses are to be continued, they should be reorganised and made coherent.

.

TRANSFERS BEYOND THE AGE OF 18

33. That, if English education is to remain democratic, it is essential that provision should be made for transferring to Universities men who have distinguished themselves in their daily work and in their part-time studies, and who will normally enter Universities at a later age than boys who enter

direct, or almost direct, from school; and that the general test for persons of riper years entering the University otherwise than through the Secondary Schools should be largely *viva-voce* in character and should partake of the nature of the present alternative matriculation examination provided for ex-service men by the Joint Matriculation Board of the Northern Universities.

34. That there should be a larger measure of interchange of graduate students between British Universities at home and overseas, so that men who have taken their degrees may more easily migrate to another University for a course of graduate study and training in methods of research.

35. That provision should be made for the transfer back to Universities, for courses of graduate study and research, of men who have already had several years of industrial, commercial, or other experience since leaving their Universities.

EDUCATION BEYOND THE AGE OF 21

36. That English Universities should further develop courses of graduate study and training in methods of research.

37. That there should be a greater development of University part-time classes, such as the tutorial classes conducted under the auspices of the Workers' Educational Association, so that those who have passed the ordinary educational age may modernise their ideas and enlarge their outlook.

GENERAL

38. That spiritual forces and spiritual values are of supreme importance in education.

39. That in all education attention should be paid to physical fitness and to all means of developing and increasing it; and that adequate provision of school buildings, playgrounds, and playing-fields should be made to this end.

40. That steps should be taken to secure correctness of speech in all types of school and in all parts of England.

To this end opportunity should be given to individual children to receive lessons in elocution.

41. That throughout his education efforts should be made to teach the pupil or student to express himself in clear and concise English; and that to this end every teacher in every school should constitute himself a teacher of English.

SCHOLARSHIPS AND MAINTENANCE ALLOWANCES

42. That there should be available scholarships together with such maintenance allowances as are required to secure that every kind of education is brought within the reach of all British subjects of sufficient educational promise, whatever their place of residence in the United Kingdom or their private financial circumstances.

43. That any test, whether by examination or otherwise, that may be applied to young people with a view to the selection of the ablest for transfer to institutions of a higher type, should be supplemented by written reports from the candidates' teachers, which reports should be taken into account in deciding whom to select for transfer. The value of these reports would probably be increased by their being drawn up in some standardised form, such as experience may show to be the most suitable.

44. That in each examination the Board of Examiners should contain persons who have had recent practical experience of teaching of the type which is being tested.

45. That local education authorities be urged to come to an agreement by which a scholarship of any type awarded to a scholar in one area should be continued in any other area if the scholar should change his place of residence.

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